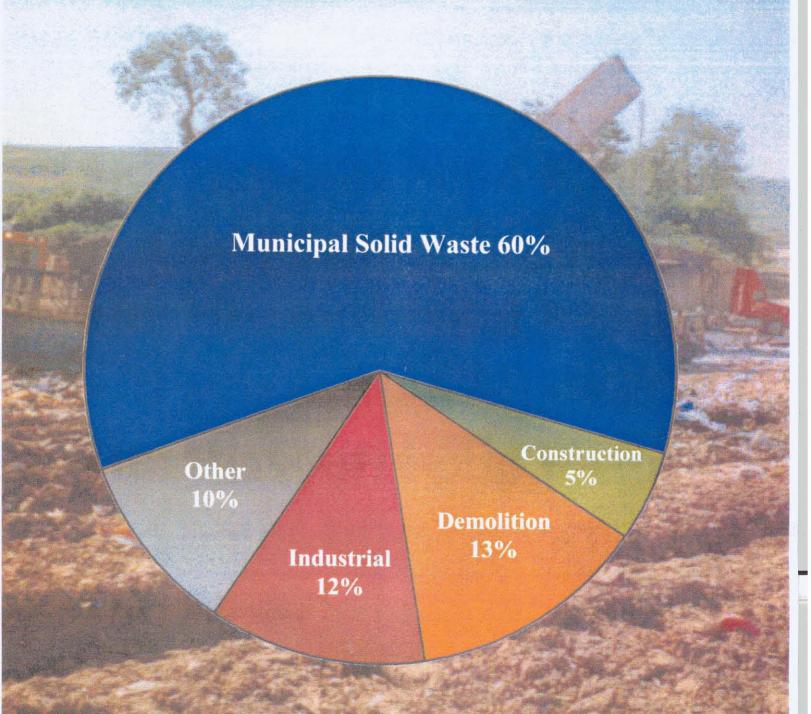
# The Missouri Solid Waste Composition Study



Midwest Assistance Program
1999

# THE MISSOURI SOLID WASTE COMPOSITION STUDY

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# Conducted by: MIDWEST ASSISTANCE PROGRAM, Inc. The Midwestern Rural Community Assistance Program

Funded by a grant from:
THE MISSOURI DEPARTMENT OF
NATURAL RESOURCES



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MSW Sort Supervisor....Kristi Wilson

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## INTRODUCTION

The Missouri Waste Composition Study was a three-year effort to characterize and understand solid waste disposal in Missouri. The study was divided into two phases.

The first phase examined Municipal Solid Waste (MSW) at 19 landfills and transfer stations throughout Missouri. Municipal Solid Waste was separated, weighed, and recorded into 26 material categories. The methodology used, and the findings of phase I begin on page 93.

The second phase observed solid waste received at 14 Missouri landfills (actually 15 landfills were observed but the scale data from the Lee's Summit landfill was not useable and therefore that data is not included). Each solid waste load was classified into one of five components (Municipal Solid Waste, Construction, Demolition, Industrial, and Other waste) and the percentage of each material, within that component, was visually estimated and recorded. The methodology and findings of phase II begin on page 3.

#### Purpose of the Study

The Missouri Waste Composition Study was commissioned for the following reasons:

- Provide Information on changes in the Missouri solid waste components. In the 1987
   Environmental Improvement and Energy Resources Authority (EIERA) commissioned a
   limited baseline waste composition study. This study examined MSW at four locations in
   1987and estimated industrial waste based on SIC data. A comparison of the two waste
   components composition studies is listed on Pg. 113.
- Provide an estimate of the volume of recyclable materials still in the Missouri solid waste.
   The percentage of recyclable materials presently disposed into Missouri landfills offers opportunities for future recycling and waste reductions efforts.
- Provide data for the formulation of a statewide solid waste plan. The waste composition data provides detailed information, which is essential in planning solid waste policy for the next decade.
- Provide information on the current solid waste components which can be used by grant
  applicants to estimate available waste materials used by state agencies to evaluate grant
  applications, and by solid waste planners to target waste materials for future funding.
- Provide essential information for municipal and private recycling programs. Municipal and
  private recycling companies can use the data to predict material flows, route collection
  vehicles, plan processing and end market capacities, project revenues and operating expenses,
  and target educational materials.

#### Funding, Development, and Implementation

The Missouri Waste Composition Study was funded through grants from the Missouri Department of Natural Resources (DNR). The methodology for the study was developed jointly by the DNR Solid Waste Planners and the Midwest Assistance Program, Inc.(MAP). MAP conducted the study under the direction of Dennis Siders, Project Manager.

## LANDFILLS OBSERVED

Landfill observation was actually the second phase of The Missouri Waste Composition Study. The hand sorting and categorizing of MSW was done prior to observing the landfills. However it is necessary to identify and understand the percentage each of the solid waste components (MSW, Construction, Demolition, Industrial, and Other) before examining the components separately. Therefore, phase II (landfill observations) will be discussed before phase I (MSW characterization).

#### The Problem

Many studies have been conducted throughout the United States to determine MSW composition. Some of these are discussed on page 111. However MSW is only one component of the overall solid waste problem. Until the entire solid waste component is examined and quantified, the volume of any one component cannot be accurately estimated. After completing phase I (MSW) it was known how much of each material was in Missouri's MSW component. For instance, about 18.7% of the MSW was food waste. But what did that percentage mean and what percentage of the total waste stream was MSW food waste?

Each landfill and transfer station reports their total waste received to DNR each quarter. After estimating import and export waste, DNR publishes a report on the total waste disposed in Missouri. However, it cannot be assumed that 18.7% of this total is food waste because the total is not exclusively MSW. There are other components of the waste stream included in the total. But how do we know what portion each of these components comprise, and what materials make up these other components?

#### Methodology

Several studies have been conducted to determine the composition of solid waste. Many states have conducted MSW waste sorts with methodologies similar to those used in phase I (page 93). This is a great way to characterize the MSW component but does not quantify the MSW component (40% - 90% of the local waste stream), or characterize the remaining solid waste components.

Franklin and Associates have developed a methodology to estimate waste flows based on production data. This method assumes that every manufactured item has a limited life cycle and then becomes waste. This methodology works great for national or international waste projections, but become less useful on a smaller scale.

The Missouri Waste Composition Study determined that the best way to estimate waste components (not waste generation or recovery) delivered to Missouri landfills, and the materials within these components, was to observe and record waste unloaded at Missouri landfills.

#### Landfill Selection

As of June 1<sup>st</sup> 1999, Missouri had 30 active landfills. Fifteen landfills were selected as being representative of all Missouri landfills (The City of Lee's Summit Landfill was observed but the data was not useable due to errors in the scale software program). The 14 observed landfills are listed below with the tonnage they received in 1998. A map of the 14 landfills, that were observed, is on page 5.

| Landfills                               | 1998      | % of Total    |
|---|-----------|---------------|
| Observed                                | Tonnage   | State Tonnage |
| Black Oak                               | 283,475   | 6.3%          |
| Bridgeton                               | 913,621   | 20.4%         |
| Butler County                           | 122,185   | 2.7%          |
| City of Columbia                        | 125,867   | 2.8%          |
| City of St. Joseph                      | 120,158   | 2.7%          |
| Courtney Ridge                          | 418,625   | 9.3%          |
| Fred Weber                              | 321,269   | 7.2%          |
| Lamar                                   | 168,591   | 3.8%          |
| Lemons                                  | 196,092   | 4.4%          |
| Maple Hill                              | 114,982   | 2.6%          |
| Oak Ridge                               | 262,365   | 5.8%          |
| Peerless C&D                            | 146,249   | 3.3%          |
| Rockhill C&D                            | 123,849   | 2.8%          |
| Southeast                               | 348,260   | 7.8%          |
| Total observed landfills                | 3,665,588 | 81.7%         |
| City of Lee's Summit*                   | 80,682    | 1.8%          |
| City of Springfield**                   | 101,284   | 2.3%          |
| 14 rural landfills (not observed)***    | 628,512   | 13.9%         |
| 2 C&D landfills (not observed)****      | 12,557    | 00.3%         |
| Total unobserved landfills              | 823,035   | 18.3%         |
| Total for all Missouri Landfills (1998) | 4,488,623 | 100%          |

<sup>\*</sup>The City of Lee's Summit landfill was observed but the scale data was not useable. A weighted average from Southeast and Courtney Ridge was used to estimate waste composition.

<sup>\*\*</sup>The City of Springfield's landfill was not observed. Demographics and waste contracts are similar to the City of St. Joseph and therefore the waste composition was estimated to be similar to the City of St. Joseph Landfill.

<sup>\*\*\*</sup>A weighted average from the 5 rural landfills, which were observed, was used to estimate waste composition.

<sup>\*\*\*\*</sup> A weighted average from the 2 C&D landfills which were observed was used to estimate waste composition.

## Landfills Observed

St. Joseph

Maple Hill

Courtney Ridge Southeast

Columbia

Bridgeton

Rock Hill C&D

Fred Weber

Peerless C&D

Oak Ridge

Lamar

Black Oak

**Butler County** 

Lemons

Each of the 14 landfills listed on page four was observed for a one-week period. The only exception was the Peerless C&D, which was observed for two weeks in order to get seasonal data on C&D material flows. The premise, agreed upon by DNR and MAP, assumed that the waste received at each of the fourteen observed landfills during a randomly selected week would be similar to the waste received at that landfill during the entire year. Smaller landfills would be assumed to have the same composition as the weighted average of others landfills within their same geographic category or as in the case of Springfield, the same as a similar City.

Observations from phase I (MSW waste sorts) and discussions with landfill managers implied that there was much more variation geographically than seasonally. Therefore, three major demographic categories of landfills were established. These were landfills in:

- Large metropolitan areas (St. Louis and Kansas City)
- Small metropolitan areas (Columbia, St. Joseph and Springfield)
- · Rural areas

It was assumed that the percentage of each solid waste component, and the materials within those components, could be applied to any landfill where the demographics were similar, and the results would be acceptable.

#### Observation and Recording

The method of observation was the same for each landfill. Each truck was recorded by name and number and visually observed while they unloaded. Each load was categorized into one of five waste components (MSW, Construction, Demolition, Industrial, or Other). These categories are defined on page 7. With the exception of MSW (MSW was characterized during phase I) each load was also visually inspected and the percentage of major materials was estimated. For instance a construction load might be estimated to contain 50% wood scraps and 50% dry wall scraps. Obviously this was a subjective estimate.

Where traffic permitted, the project manager walked around each load of waste several times to visually characterize the load and assign percentages to the materials therein. None of the loads were physically sorted and weighed. Time, money, and landfill space were all limiting factors, which made this activity prohibitive.

At the close of each day a copy of the scale log was obtained from the landfill staff. The scale weights were then matched with the appropriate truck and recorded. The truck number, weight, waste component assignment, and percentage of materials within each component were then entered onto a Microsoft Excel spreadsheet. All weights were entered twice, once for waste component assignment and again for material percentage estimates in order to assure a double check for accuracy.

The following table summarizes the observation data. In order to maintain consistency, the project manager personally observed all loads, made all estimates on waste composition, and assigned all material percentages.

| Observation Data   |                   |                 |                        |  |  |  |  |  |
|--------------------|-------------------|-----------------|------------------------|--|--|--|--|--|
| Landfill           | Observation hours | Trucks Observed | Total tonnage observed |  |  |  |  |  |
| Black Oak          | 38                | 249             | 3,735                  |  |  |  |  |  |
| Bridgeton          | 47                | 1,063           | 9,196                  |  |  |  |  |  |
| Butler County      | 50                | 182             | 2,077                  |  |  |  |  |  |
| City of Columbia   | 55                | 470             | 1,808                  |  |  |  |  |  |
| City of St. Joseph | 47                | 667             | 2,109                  |  |  |  |  |  |
| Courtney Ridge     | 45                | 733             | 4,350                  |  |  |  |  |  |
| Fred Weber         | 36                | 797             | 3,040                  |  |  |  |  |  |
| Lamar              | 47                | 197             | 2,769                  |  |  |  |  |  |
| Lemons             | 49                | 257             | 3,000                  |  |  |  |  |  |
| Maple Hill         | 38                | 221             | 1,757                  |  |  |  |  |  |
| Oak Ridge          | 44                | 720             | 6,172                  |  |  |  |  |  |
| Peerless C&D       | 96                | 777             | 5,355                  |  |  |  |  |  |
| Rockhill C&D       | 38                | 420             | 1,697                  |  |  |  |  |  |
| Southeast          | 44                | 660             | 4,485                  |  |  |  |  |  |
| Total              | 674               | 7,413           | 51,550                 |  |  |  |  |  |

#### **Definition of Waste Components**

The solid waste stream is made up of a number of waste components. Identifying and defining these components is always difficult. There are no national guidelines or norms on how to categorize waste components. In order to accomplish the purposes outlined on page 1, the following guidelines were used to categorize solid waste into waste components:

#### Municipal Solid Waste (MSW)

For the purpose of this study MSW is defined as residential, institutional, or commercial waste that is disposed in small containers or plastic bags. This is a somewhat simplistic definition but is inclusive enough to cover most of the materials found in the MSW component. MSW is normally collected in packer trucks, which collect from residential, institutional, and commercial generators. In many cases the same truck will collect MSW from all three generators in the same load. MSW is generally delivered to the landfill in packer trucks or transfer trailers. Some rural landfills still receive MSW in open top trucks or trailers. Definitions of the sort categories contained within the MSW component are on page 97.

#### Construction Waste

The construction waste component was identified by interviewing the driver, when possible, concerning the origin of the load, and examining the contents of each load. Construction waste loads were primarily transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Construction waste consists of mostly new construction material, which was a waste product of the construction process. The construction loads tended to be lighter, less weathered, and more homogeneous (all wood or dry wall, etc.) than demolition loads. As a

general rule construction waste materials are easier to recover and recycle than demolition waste materials. Definitions of the major materials contained within the construction waste component are on page 123.

#### **Demolition Waste**

Demolition waste materials are similar to construction waste materials and are traditionally included together as "construction and demolition (C&D)". Demolition materials are older, usually mixed with other materials, and more difficult to recover or recycle. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Roofing waste was typically delivered to the landfill by independent contractors and was not mixed with other materials. Demolition wood was more weathered, there was very little if any cardboard, and there was more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste component than the construction waste component. Definitions of the major materials contained within the demolition waste component are on page 127.

#### **Industrial Waste**

The industrial waste component is a waste product of industrial processing or industrial activity. Materials were identified and estimated when there was large volumes of the same material in a packer, compactor unit, or roll-off container. Industrial waste loads were normally homogeneous, containing a single waste product from a manufacturing process. Definitions of the major materials contained within the industrial waste component are on page 131.

#### Other Waste

Other waste is defined as waste which does not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items such as furniture, mattresses, appliances, bicycles, shelving etc. are included in the other waste category. Commercial yard waste such as brush, stumps, sewage sludge, and hay are also included in this category. Definitions of the major materials contained within the other waste component are on page 135

The results of each landfill observation are included on pages 9-92. Each landfill profile contains a description of the facility, information about the observation period, tonnage and percentages of waste received during the observation period.

The summary table in each profile lists the tonnage of each material received during the observation period and the percentage of that material. The Percentages are applied to the total waste received by that facility in 1998 to provide an estimate of the total tonnage for each material received during 1998.

The charts in each profile illustrate the percentage of each waste component for that facility, the materials received within each waste component and percentage comparisons to other landfills and the state average.

## **Black Oak Landfill**

The Black Oak Landfill is located in Wright County, approximately 5 miles east of Hartville, MO. It is owned and operated by Waste Management Inc. The disposal facility covers 82 acres and is permitted to accept all municipal solid waste (MSW) and some other wastes such as asbestos, contaminated soils and waste water treatment sludge.

The Black Oak Landfill accepted 234,846 tons in 1996, 244,174 tons in 1997 and 283,475 tons in 1998. The landfill operation was observed from Monday April 12<sup>th</sup> through Thursday April 15<sup>th</sup>, 1999. The weather was fair for the first two days but rained and turned cold on Wednesday and Thursday. Observation took place from 7 AM till 4:30 PM on the above dates. The composition of the waste was so predictable that the observation period was shortened from five days down to four days. During the four-day observation period 249 trucks, delivered 3,735 tons of waste to the landfill. The landfill staff felt the material received during the observation period was typical of material received year round. They occasionally receive small quantities of asbestos and contaminated soil but those quantities are statistically nil.

All loads could be classified visually, without any driver data.

## The Total Waste Stream - 3,735 tons

The total waste stream was overwhelmingly Municipal Solid Waste (MSW). The source of the MSW portion is primarily residential, institutional, and light commercial waste. The MSW was delivered to the landfill in trailers from company owned transfer stations and local packer trucks.

Total waste received during the observation period was 3,735 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

|           |         | waste Stream | Components        |         |
|-----------|---------|--------------|-------------------|---------|
| MSW       | Const.  | Demo         | <b>Industrial</b> | Other   |
| 95.4%     | 0.5%    | 1.0%         | 1.6%              | 1.4%    |
| 3565 tons | 18 tons | 38 tons      | 61 tons           | 53 tons |

## Municipal Solid Waste - 3,565 Tons

Municipal Solid Waste (MSW) accounted for 95% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally contained within plastic bags. However, MSW was sorted and recorded at 19 landfills and transfer stations as part of this study in 1996 and 97. During the 56 sorts 632 samples, weighing

an average of 222 pounds each, were examined. Each of these samples were hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and volume. Further details are available in the *Missouri Waste Composition Study: Municipal Solid Waste*.

The total MSW received during the observation period was 3,565 tons. The average percentage of each major material category found in the 1996-97 waste sorts was applied to the tonnage received during the observation period and is displayed below.

#### **Municipal Solid Waste Components**

| Paper     | Glass    | Metals   | Plastics | Organics  | Inorganics |
|-----------|----------|----------|----------|-----------|------------|
| 37.3%     | 5.8%     | 6.9%     | 14.4%    | 30.8%     | 4.8%       |
| 1330 tons | 207 tons | 246 tons | 513 tons | 1098 tons | 171 tons   |

## **Construction Waste - 18 Tons**

Only about 0.5% of the total waste received was from new construction sources. Construction waste loads are typically transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Only two roll-off trucks delivered construction waste during the observation period. One was primarily masonry materials (bricks, concrete blocks, and gravel). The other was a combination of wood dry wall and cardboard.

Total construction waste received during the observation period was 18 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

#### **Construction Waste Components**

| Wood   | Dry Wall | Masonry | Metal  | Plas.  | Cardbrd | Other  |
|--------|----------|---------|--------|--------|---------|--------|
| 20%    | 4%       | 72%     | 0%     | 0%     | 4%      | 0%     |
| 4 tons | 1 ton    | 12 tons | 0 tons | 0 tons | 1 ton   | 0 tons |

## **Demolition Waste - 38 Tons**

About 1% of the total waste was from demolition sources. Demolition waste loads are usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. However at this landfill most demolition materials were received in the transfer trailers and those materials were estimated and recorded as part of the demolition component. Two roofing waste loads were delivered to the landfill by independent contractors and were not mixed with other materials. The remaining demolition loads contained more mixed materials. The other category was primarily wet insulation brought in by a local packer.

Total demolition waste received during the observation period was 38 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed on page 11.

| The | Dem | olition  | Waste   | Component |
|-----|-----|----------|---------|-----------|
|     |     | OHILIVIA | vi asic | Component |

| Wood    | Dry Wall | Roof    | Masonry | Metal | Carpet | Other  |
|---------|----------|---------|---------|-------|--------|--------|
| 26%     | 9%       | 27%     | 4%      | 4%    | 16%    | 14%    |
| 10 tons | 3 tons   | 11 tons | 2 tons  | 1 ton | 6 tons | 5 tons |

## **Industrial Waste - 61 Tons**

About 1.6% of the total waste was from industrial sources. Almost all industrial materials came in on transfer trailers. Large quantities of industrial paper, cardboard and wood within the transfer trailers were identified as part of the industrial component and materials were estimated and recorded as a portion of the total weight of the trailer. Most wood was in the form of pallets and crates.

Total industrial waste received during the observation period was 61 tons. The materials within the industrial waste component were estimated as they were unloaded. These estimated materials are listed below.

## The Industrial Waste Component

| Cardbrd | Paper   | Food   | Metal  | Wood    | Plas.  | Tex.   | Rbr.   | Other  |
|---------|---------|--------|--------|---------|--------|--------|--------|--------|
| 40%     | 18%     | 0%     | 0%     | 36%     | 6%     | 0%     | 0%     | 0%     |
| 25 tons | 11 tons | 0 tons | 0 tons | 21 tons | 4 tons | 0 tons | 0 tons | 0 tons |

## Other Waste - 53 Tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items were the only other waste observed. They include furniture, mattresses, appliances, bicycles, etc. Most of these bulky items were received in transfer trailers.

Total other waste received during the observation period was 53 tons. The materials within the other waste stream were estimated as they were unloaded. These estimated materials are listed below.

## The Other Waste Component

Bulky Items 100% 53 tons

## **BLACK OAK LANDFILL**

## 283,475 TONS IN 1998

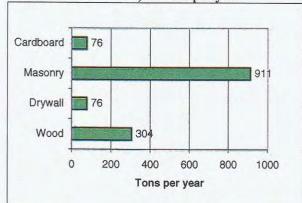
| MATERIAL                 | Tons received during observation period | Percent of each material received | Estimated t | and a color of the Table |
|--------------------------|---|-----------------------------------|-------------|--------------------------|
| MSW Component            | 22220 Such 22122                        |                                   | based on o  |                          |
| Paper                    | 1330 Tons                               | 35.6%                             | 100,943     |                          |
| Glass                    | 207 Tons                                | 5.5%                              | 15,711      |                          |
| Metals                   | 246 Tons                                | 6.6%                              | 18,671      |                          |
| Plastics                 | 513 Tons                                | 13.7%                             | 38,935      |                          |
| Organics                 | 1098 Tons                               | 29.4%                             | 83,335      |                          |
| Inorganics               | 171 Tons                                | 4.6%                              | 12,978      |                          |
| TOTAL MSW                | 3565 Tons                               | 95.4%                             | 270,573     |                          |
| Construction Waste       |   |                                   |             |                          |
| Wood                     | 4 Tons                                  | 0.1%                              | 304         | Tons                     |
| Dry Wall                 | 1 Tons                                  | 0.0%                              | 76          | Tons                     |
| Masonry                  | 12 Tons                                 | 0.3%                              | 911         | Tons                     |
| Metal                    | 0 Tons                                  | 0.0%                              |             | Tons                     |
| Plastic                  | 0 Tons                                  | 0.0%                              |             | Tons                     |
| Cardboard                | 1 Tons                                  | 0.0%                              |             | Tons                     |
| Other                    | 0 Tons                                  | 0.0%                              | -           | Tons                     |
| TOTAL CONSTRUCTION       | 18 Tons                                 | 0.5%                              |             | Tons                     |
| Demolition Waste         |   |                                   |             |                          |
| Wood                     | 10 Tons                                 | 0.3%                              | 759         | Tons                     |
| Dry Wall                 | 3 Tons                                  | 0.1%                              | 228         | Tons                     |
| Roofing                  | 11 Tons                                 | 0.3%                              | 835         | Tons                     |
| Masonry                  | 2 Tons                                  | 0.1%                              | 152         | Tons                     |
| Metal                    | 1 Tons                                  | 0.0%                              | 76          | Tons                     |
| Carpet                   | 6 Tons                                  | 0.2%                              | 455         | Tons                     |
| Other                    | 5 Tons                                  | 0.1%                              | 379         | Tons                     |
| TOTAL DEMOLITION         | 38 Tons                                 | 1.0%                              | 2,884       | Tons                     |
| Industrial Waste         |   |                                   |             |                          |
| Cardboard                | 25 Tons                                 | 0.7%                              | 1,897       | Tons                     |
| Paper                    | 11 Tons                                 | 0.3%                              | 835         | Tons                     |
| Food                     | 0 Tons                                  | 0.0%                              | 1.0         | Tons                     |
| Metal                    | 0 Tons                                  | 0.0%                              | 2           | Tons                     |
| Wood                     | 21 Tons                                 | 0.6%                              | 1,594       | Tons                     |
| Plastic                  | 4 Tons                                  | 0.1%                              | 304         | Tons                     |
| Textiles                 | 0 Tons                                  | 0.0%                              | 1/4         | Tons                     |
| Rubber                   | 0 Tons                                  | 0.0%                              | 14          | Tons                     |
| Other                    | 0 Tons                                  | 0.0%                              |             | Tons                     |
| TOTAL INDUSTRIAL         | 61 Tons                                 | 1.6%                              | 4,630       | Tons                     |
| Other Wastes             |   |                                   |             |                          |
| Bulky Items              | 53 Tons                                 | 1.4%                              | 4,023       | Tons                     |
| Soil and Inert Materials | 0 Tons                                  | 0.0%                              | 4           | Tons                     |
| Asbestos                 | 0 Tons                                  | 0.0%                              |             | Tons                     |
| Commercial yard waste    | 0 Tons                                  | 0.0%                              | -           | Tons                     |
| TOTAL OTHER WASTE        | 53 Tons                                 | 1.4%                              | 4,023       | Tons                     |
| TOTAL WASTE STREAM       | 3735 Tons                               | 100%                              | 283,475     | Tons                     |

## The Black Oak Landfill

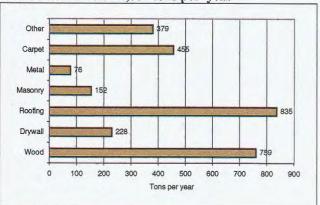
Total Waste Component - 283,475 tons per year



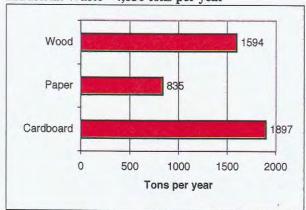




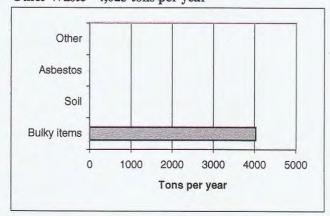
#### Demolition Waste - 2,884 tons per year



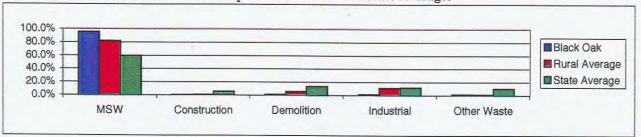
Industrial Waste - 4,630 tons per year



Other Waste - 4,023 tons per year



Black Oak Waste Components vs. Rural and State Averages



## **Bridgeton Landfill**

The Bridgeton Landfill is located in Bridgeton, MO., approximately 20 miles west of St. Louis, MO. It is owned and operated by Allied Waste Industries Inc. The disposal facility covers 52 acres and is permitted to accept all municipal solid waste (MSW) and other wastes such as asbestos, fly ash, contaminated soils and waste water treatment sludge.

The Bridgeton Landfill accepted 797,280 tons in 1996, 912,287 tons in 1997 and 913,621 tons in 1998. The landfill operation was observed from Monday May 17<sup>th</sup> through Friday May 21<sup>st</sup>, 1999. The weather was sunny and fair for the entire observation period. Observation took place from 7 AM till 4:00 PM on the above dates. The Bridgeton Landfill is open 24 hours a day and therefore not all trucks were observed. During the five-day period 1,063 trucks (54% of the total trucks )were observed and recorded. The landfill staff felt the material received during the observation period was typical of material received year round.

Due to the heavy traffic and small dumping area drivers were not asked where the loads originated. However, all loads could be classified visually, without any driver data.

## The Total Waste Stream - 9,196 tons

The total waste stream was predominately Municipal Solid Waste (MSW). The source of the MSW portion is primarily residential, institutional, and light commercial waste. The MSW was delivered to the landfill in local packer trucks and transfer trucks from the City of St. Louis's North Transfer Station. Total waste observed during the period was 9,196 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

| MSW       | Const.   | Demo     | Industrial | Other     |  |
|-----------|----------|----------|------------|-----------|--|
| 67%       | 5%       | 6%       | 11%        | 12%       |  |
| 6137 tons | 416 tons | 565 tons | 1022 tons  | 1056 tons |  |

## Municipal Solid Waste - 6,137 tons

Municipal Solid Waste (MSW) accounted for 67% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally contained within plastic bags. However, MSW was sorted and recorded at 19 landfills and transfer stations as part of this study in 1996 and 97. During the 56 sorts 632 samples, weighing an average of 222 pounds each, were examined. Each of these samples was hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and

volume. Further details are available in the Missouri Waste Composition Study: Municipal Solid Waste.

The total MSW received during the observation period was 6137 tons. The average percentage of each major material category found in the 1996-97 waste sorts was applied to the tonnage received during the observation period and is displayed below.

| Municipal | Solid | Waste | Com | ponents |
|-----------|-------|-------|-----|---------|
|-----------|-------|-------|-----|---------|

| Paper     | Glass    | Metals   | Plastics | Organics  | Inorganics |
|-----------|----------|----------|----------|-----------|------------|
| 37.3%     | 5.8%     | 6.9%     | 14.4%    | 30.8%     | 4.8%       |
| 2289 tons | 356 tons | 423 tons | 884 tons | 1890 tons | 295 tons   |

## Construction Waste - 416 tons

About 5% of the total waste was received from new construction sources. Construction waste loads were transported to the landfill in open top roll-off containers, dump trucks, or open trailers.. The construction loads tended to be lighter, less weathered, and more homogeneous (all wood and dry wall).

Total construction waste received during the observation period was 416 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

#### **Construction Waste Components**

| Wood     | Dry Wall | Masonry | Metal  | Plas.   | Cardboard | Other  |
|----------|----------|---------|--------|---------|-----------|--------|
| 47%      | 17%      | 18%     | 0%     | 5%      | 11%       | 2%     |
| 194 tons | 72 tons  | 76 tons | 1 tons | 21 tons | 45 tons   | 7 tons |

## **Demolition Waste - 565 tons**

About 6% of the total waste was from demolition sources. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Roofing waste was typically delivered to the landfill by independent contractors and was not mixed with other materials. The remaining demolition loads contained more mixed materials. The wood was more weathered, there was very little if any cardboard, and there was more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste as compared to the construction waste.

Total demolition waste received during the observation period was 565 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed on the next page.

| The Demolition Wa | ste Component |
|-------------------|---------------|
|-------------------|---------------|

| Wood     | Dry Wall | Roof    | Masonry  | Metal   | Carpet  | Other   |
|----------|----------|---------|----------|---------|---------|---------|
| 34%      | 12%      | 9%      | 32%      | 4%      | 7%      | 2%      |
| 189 tons | 69 tons  | 53 tons | 179 tons | 23 tons | 42 tons | 10 tons |

## Industrial Waste - 1,022 tons

Industrial waste loads were usually transported to the landfill in open top roll-off containers or compactor units. They were normally homogeneous, containing single waste products from a manufacturing process. A large portion of the wood waste was sawdust and wood shavings from a local firm that manufactures commercial fixtures from presswood materials. The materials in the "other" category listed below were primarily a sludge product from a manufacturer.

Total industrial waste received during the observation period was 1,022 tons. The materials within the industrial waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Industrial Waste Component

| Cardboard | Paper   | Food   | Metal | Wood     | Plas.   | Tex.    | Rbr.   | Other   |
|-----------|---------|--------|-------|----------|---------|---------|--------|---------|
| 43%       | 6%      | 0%     | 0%    | 36%      | 8%      | 2%      | 0%     | 4%      |
| 437 tons  | 66 tons | 0 tons | 1 ton | 365 tons | 87 tons | 23 tons | 2 tons | 41 tons |

## Other Waste - 1,056 tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items include furniture, mattresses, appliances, etc. Most of these bulky items were received in open top roll-off containers. The soil was not contaminated and was used for cover. The "Other" category consisted mostly of fly ash.

Total Other waste received during the observation period was 1056 tons. The materials within the Other waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Other Waste Component

| <b>Bulky Items</b> | Sewage Sludge | Soil     | Asbestos | Other   |
|--------------------|---------------|----------|----------|---------|
| 6%                 | 8%            | 70%      | 10%      | 5%      |
| 62 tons            | 88 tons       | 738 tons | 109 tons | 59 tons |

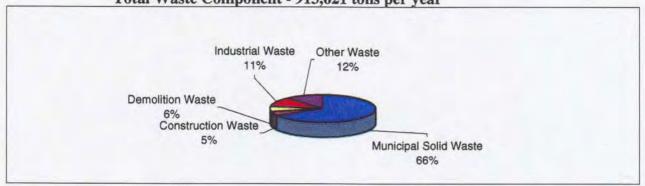
## **BRIDGETON LANDFILL**

## 913,621 TONS IN 1998

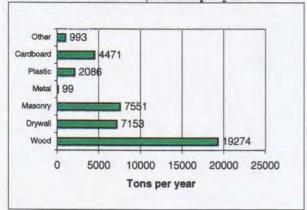
| MATERIAL                 | Tons received during observation period | Percent of each<br>material received | Estimated received in |             |
|--------------------------|---|--------------------------------------|-----------------------|-------------|
| MSW Component            |   |                                      | based on o            | observation |
| Paper                    | 2289 Tons                               | 24.9%                                | 227,412               | Tons        |
| Glass                    | 356 Tons                                | 3.9%                                 | 35,369                | Tons        |
| Metals                   | 423 Tons                                | 4.6%                                 | 42,025                | Tons        |
| Plastics                 | 884 Tons                                | 9.6%                                 | 87,825                | Tons        |
| Organics                 | 1890 Tons                               | 20.6%                                | 187,771               | Tons        |
| Inorganics               | 295 Tons                                | 3.2%                                 | 29,308                | Tons        |
| TOTAL MSW                | 6137 Tons                               | 66.7%                                | 609,710               | Tons        |
| Construction Waste       |   |                                      |                       |             |
| Wood                     | 194 Tons                                | 2.1%                                 | 19,274                | Tons        |
| Dry Wall                 | 72 Tons                                 | 0.8%                                 | 7,153                 | Tons        |
| Masonry                  | 76 Tons                                 | 0.8%                                 | 7,551                 | Tons        |
| Metal                    | 1 Tons                                  | 0.0%                                 | 99                    | Tons        |
| Plastic                  | 21 Tons                                 | 0.2%                                 | 2,086                 | Tons        |
| Cardboard                | 45 Tons                                 | 0.5%                                 | 4,471                 | Tons        |
| Other                    | 7 Tons                                  | 0.1%                                 | 695                   | Tons        |
| TOTAL CONSTRUCTION       | 416 Tons                                | 4.5%                                 | 41,330                | Tons        |
| Demolition Waste         |   |                                      |                       |             |
| Wood                     | 189 Tons                                | 2.1%                                 | 18,777                |             |
| Dry Wall                 | 69 Tons                                 | 0.8%                                 | 6,855                 | Tons        |
| Roofing                  | 53 Tons                                 | 0.6%                                 |                       | Tons        |
| Masonry                  | 179 Tons                                | 1.9%                                 | 17,784                |             |
| Metal                    | 23 Tons                                 | 0.3%                                 |                       | Tons        |
| Carpet                   | 42 Tons                                 | 0.5%                                 |                       | Tons        |
| Other                    | 10 Tons                                 | 0.1%                                 |                       | Tons        |
| TOTAL DEMOLITION         | 565 Tons                                | 6.1%                                 | 56,133                | Tons        |
| Industrial Waste         |   |                                      | 12.00 00.00           |             |
| Cardboard                | 437 Tons                                | 4.8%                                 | 43,416                |             |
| Paper                    | 66 Tons                                 | 0.7%                                 | 6,557                 | Tons        |
| Food                     | 0 Tons                                  | 0.0%                                 | -                     | Tons        |
| Metal                    | 1 Tons                                  | 0.0%                                 |                       | Tons        |
| Wood                     | 365 Tons                                | 4.0%                                 | 36,263                |             |
| Plastic                  | 87 Tons                                 | 0.9%                                 |                       | Tons        |
| Textiles                 | 23 Tons                                 | 0.3%                                 | 9.100                 | Tons        |
| Rubber                   | 2 Tons                                  | 0.0%                                 |                       | Tons        |
| Other                    | 41 Tons                                 | 0.4%                                 |                       | Tons        |
| TOTAL INDUSTRIAL         | 1022 Tons                               | 11.1%                                | 101,536               | Ions        |
| Other Waste              |   | 2.22                                 | 2 2 2 2               | Time        |
| Bulky Items              | 62 Tons                                 | 0.7%                                 |                       | Tons        |
| Soil and Inert Materials | 738 Tons                                | 8.0%                                 | 73,320                |             |
| Asbestos                 | 109 Tons                                | 1.2%                                 | 10,829                |             |
| Other                    | 147 Tons                                | 1.6%                                 | 14,604                |             |
| TOTAL OTHER WASTE        | 1056 Tons                               | 11.5%                                | 104,913               | ions        |
| TOTAL WASTE STREAM       | 9196 Tons                               | 100%                                 | 913,621               | Tons        |

## The Bridgeton Landfill

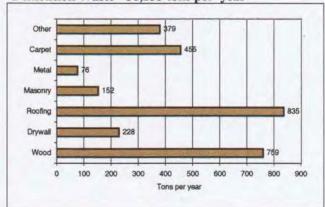
Total Waste Component - 913,621 tons per year



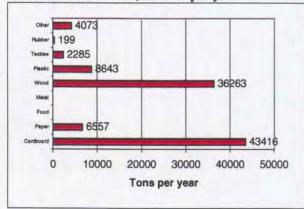




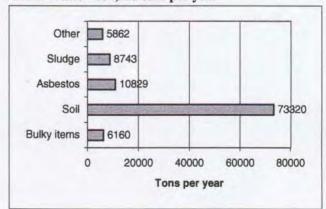
#### Demolition Waste - 56,133 tons per year



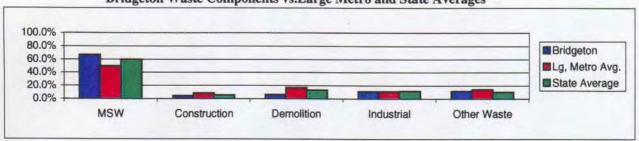
Industrial Waste - 101,536 tons per year



Other Waste - 104,913 tons per year



Bridgeton Waste Components vs.Large Metro and State Averages



## **Butler County Landfill**

The Butler County Landfill is located in Butler County, MO., approximately 10 miles north of Poplar Bluff. It is owned and operated by Allied Waste Industries Inc. The disposal facility covers 80 acres and is permitted to accept all municipal solid waste (MSW) and some Other wastes such as contaminated soils and waste water treatment sludge.

Butler County Landfill accepted 101,087 tons in 1996, 127,575 tons in 1997 and 122,185 tons in 1998. The landfill operation was observed from Monday October 5<sup>th</sup> through Friday October 9th. The weather was rainy on Monday and Tuesday but fair the remainder of the week. The rain seemed to reduce construction and demolition waste during the period. Observation took place from 7 AM till 4:30 PM on the above dates. During the observation period, 182 trucks, delivered 2,077 tons of waste to the landfill. All loads were observed and recorded. The landfill staff felt the material received during the observation period was typical of material received year round.

Each driver was asked where the load originated. This was done to determine in what classification (MSW, construction, demolition, industrial, or Other) the load should be recorded. However, most loads could be classified visually, without any driver data.

The Butler County Landfill accepts waste from three transfer stations. The St.Francois County Environmental Corp. in Park Hills, the Tri County transfer station in the bootheel area, and the City of Fredericktown transfer station in Fredericktown. These three sources represented 27% (46 trailers and roll-offs) of the traffic and 55% of the total waste. There were some demolition materials observed and recorded in these transfer loads but the overwhelming majority of the transfer station waste was MSW.

## The Total Waste Stream - 2,077 tons

The total waste stream was predominately Municipal Solid Waste (MSW). The source of the MSW portion is primarily residential, institutional, and light commercial waste. The MSW was delivered to the landfill in transfer trailers and local packer trucks.

Total waste received during the observation period was 2,077 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

| MSW       | Const.  | Demo     | Industrial | Other    |  |
|-----------|---------|----------|------------|----------|--|
| 76%       | 2%      | 8%       | 5%         | 9%       |  |
| 1586 tons | 39 tons | 161 tons | 109 tons   | 180 tons |  |

## Municipal Solid Waste - 1,586 tons

Municipal Solid Waste (MSW) accounted for 76% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally contained within plastic bags. However, three MSW sorts were conducted at the Butler County landfill in 1997. During the three waste sorts 32 samples, weighing an average of 255 pounds each, were examined. Each of these samples were hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and volume. Further details are available in the *Missouri Waste Composition Study: Municipal Solid Waste*.

The total MSW received during the observation period was 1586 tons. The percentage of each major material category found in the 1997 sort was applied to the tonnage received during the observation period and is displayed below.

#### **Municipal Solid Waste Components**

| Paper    | Glass   | Metals   | Plastics | Organics | Inorganics |
|----------|---------|----------|----------|----------|------------|
| 36%      | 5.5%    | 8.1%     | 14.3%    | 31.1%    | 4.5%       |
| 573 tons | 87 tons | 128 tons | 227 tons | 493 tons | 71 tons    |

## **Construction Waste - 39 tons**

About 2% of the total waste received was from new construction sources. Construction waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. The area served by the landfill is not a fast growing area and open burning is permitted in most municipalities and all counties. Both of these factors may have contributed to the low amount of construction waste. The construction loads tended to be lighter, less weathered, more homogeneous (all wood, dry wall, etc), and contained more cardboard boxes (usually from fixtures) than the demolition waste loads.

Total construction waste received during the observation period was 39 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

| Construction Waste Components |          |         |        |        |        |        |  |  |
|-------------------------------|----------|---------|--------|--------|--------|--------|--|--|
| Wood                          | Dry Wall | Masonry | Metal  | Plas.  | OCC    | Other  |  |  |
| 37%                           | 43%      | 0%      | 0%     | 0%     | 7%     | 13%    |  |  |
| 14 tons                       | 17 tons  | 0 tons  | 0 tons | 0 tons | 3 tons | 5 tons |  |  |

## **Demolition Waste - 161 tons**

About 8% of the total waste was from demolition sources. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Almost

half (49%) of the of the demolition waste was roofing shingles. Roofing waste was typically delivered to the landfill by independent contractors and was not mixed with other materials. The remaining demolition loads contained more mixed materials. The wood was more weathered, there was very little if any cardboard, and there was more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste as compared to the construction waste.

Total demolition waste received during the observation period was 161 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed below.

| The Demolition Was | te Component |
|--------------------|--------------|
|--------------------|--------------|

| Wood    | Dry Wall | Roof    | Masonry | Metal  | Carpet  | Other  |
|---------|----------|---------|---------|--------|---------|--------|
| 14%     | 23%      | 49%     | 3%      | 1%     | 10%     | 0%     |
| 23 tons | 37 tons  | 77 tons | 5 tons  | 0 tons | 16 tons | 0 tons |

## Industrial Waste - 267 tons

Industrial waste loads were usually transported to the landfill in open top roll-off containers or compactor units. They were normally homogeneous, containing single waste products from a manufacturing process. The rubber waste was defective auto hose material from gates and the textile was from a furniture manufacturer. The "other" industrial waste was rock dust, black char, and firebricks from local manufacturers.

Total industrial waste received during the observation period was 267 tons. The materials within the industrial waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Industrial Waste Component

| Cardbrd | Paper  | Food   | Metal  | Wood   | Plas.  | Tex.    | Rbr.    | Other    |
|---------|--------|--------|--------|--------|--------|---------|---------|----------|
| 3%      | 2%     | 0%     | 0%     | 3%     | 3%     | 10%     | 19%     | 59%      |
| 9 tons  | 5 tons | 0 tons | 0 tons | 7 tons | 9 tons | 28 tons | 51 tons | 158 tons |

## Other Waste - 22 tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items include furniture, mattresses, appliances, etc.

Total Other waste received during the observation period was 22 tons. The materials within the Other waste stream were estimated as they were unloaded. These estimated materials are listed below.

## The Other Waste Component

Bulky 100%

22 tons

## BUTLER COUNTY LANDFILL

## 122,185 TONS IN 1998

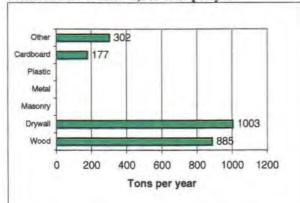
| MSW Component<br>Paper<br>Glass | observation period | material received |              | 998       |
|---------------------------------|--------------------|-------------------|--------------|-----------|
| Paper                           |                    |                   | based on obs | servation |
|                                 | 573 Tons           | 27.7%             | 33,823       | Tons      |
|                                 | 87 Tons            | 4.2%              | 5,135        | Tons      |
| Metals                          | 128 Tons           | 6.2%              | 7,556        | Tons      |
| Plastics                        | 227 Tons           | 11.0%             | 13,399       | Tons      |
| Organics                        | 493 Tons           | 23.8%             | 29,101       | Tons      |
| Inorganics                      | 72 Tons            | 3.5%              | 4,250        | Tons      |
| TOTAL MSW                       | 1580 Tons          | 76.3%             | 93,263       |           |
| Construction Waste              |                    |                   |              |           |
| Wood                            | 15 Tons            | 0.7%              |              | Tons      |
| Dry Wall                        | 17 Tons            | 0.8%              | 1,003        |           |
| Masonry                         | 0 Tons             | 0.0%              | -            | Tons      |
| Metal                           | 0 Tons             | 0.0%              | -            | Tons      |
| Plastic                         | 0 Tons             | 0.0%              | -            | Tons      |
| Cardboard                       | 3 Tons             | 0.1%              | 110.7        | Tons      |
| Other                           | 5 Tons             | 0.2%              |              | Tons      |
| TOTAL CONSTRUCTION              | 40 Tons            | 1.9%              | 2,368        | Tons      |
| Demolition Waste                |                    |                   |              |           |
| Wood                            | 23 Tons            | 1.1%              | 1,328        |           |
| Dry Wall                        | 39 Tons            | 1.9%              | 2,278        |           |
| Roofing                         | 79 Tons            | 3.8%              | 4,657        |           |
| Masonry                         | 5 Tons             | 0.2%              | 285          | Tons      |
| Metal                           | 0 Tons             | 0.0%              | -            | Tons      |
| Carpet                          | 16 Tons            | 0.8%              | 950          | Tons      |
| Other                           | 0 Tons             | 0.0%              | -            | Tons      |
| TOTAL DEMOLITION                | 161 Tons           | 7.8%              | 9,499        | Ions      |
| Industrial Waste                |                    | 20.000            | 545          | T         |
| Cardboard                       | 9 Tons             | 0.4%              |              | Tons      |
| Paper                           | 5 Tons             | 0.3%              | 322          | Tons      |
| Food                            | 0 Tons             | 0.0%              | -            | Tons      |
| Metal                           | 0 Tons             | 0.0%              | -            | Tons      |
| Wood                            | 7 Tons             | 0.3%              |              | Tons      |
| Plastic                         | 9 Tons             | 0.4%              |              | Tons      |
| Textiles                        | 28 Tons            | 1.4%              | 1,670        |           |
| Rubber                          | 51 Tons            | 2.5%              | 3,022        |           |
| Other                           | 158 Tons           | 7.7%              | 9,350        |           |
| TOTAL INDUSTRIAL                | 267 Tons           | 12.9%             | 15,780       | Ions      |
| Other Wastes                    |                    | 1 1               |              | T         |
| Bulky Items                     | 22 Tons            | 1.0%              | 1,275        |           |
| Soil and Inert Materials        | 0 Tons             | 0.0%              |              | Tons      |
| Asbestos                        | 0 Tons             | 0.0%              | -            | Tons      |
| Other                           | 0 Tons             | 0.0%              |              | Tons      |
| TOTAL OTHER WASTE               | 22 Tons            | 1.0%              | 1,275        | ions      |
| TOTAL WASTE STREAM              | 2070 Tons          | 100%              | 122,185      | Tons      |

## The Butler County Landfill

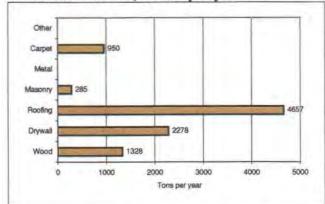
Total Waste Component - 122,185 tons per year



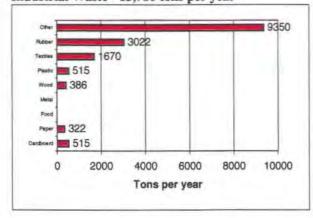
Construction Waste - 2,368 tons per year



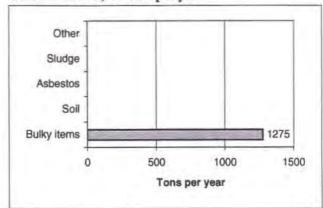
Demolition Waste - 9,499 tons per year



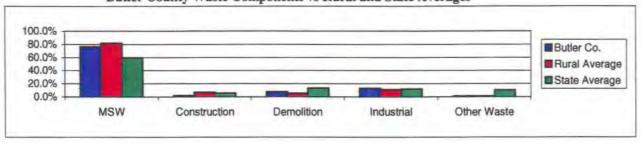
Industrial Waste - 15,780 tons per year



Other Waste - 1,275 tons per year



Butler County Waste Components vs Rural and State Averages



## City of Columbia Landfill

The City of Columbia Landfill is located in Boone County, approximately 5 miles northeast of Columbia, MO. It is owned and operated by the City of Columbia. The disposal facility covers 107 acres and is permitted to accept all municipal solid waste (MSW) and some Other wastes such as asbestos, contaminated soils and waste water treatment sludge. The City of Columbia operates a fleet of collection vehicles which collects all of the residential and most of the commercial and industrial waste within the City of Columbia. The City also operates a state of the art composting facility at the same location.

The City of Columbia Landfill accepted 122,892 tons in 1996, 181,147 tons in 1997 and 125,867 tons in 1998. The landfill operation was observed from Monday October 19<sup>th</sup> through Friday October 23rd, 1998. The weather was sunny and fair for the entire week. Observation took place from 4 AM till 5 PM on the above dates. During the five-day observation period 470 trucks, delivered 1,791 tons of waste to the landfill. The landfill staff felt the material received during the observation period was typical of material received year round. They occasionally receive small quantities of asbestos and contaminated soil but those quantities are statistically nil.

All loads could be classified visually, without any driver data.

## The Total Waste Stream - 1,791 tons

The total waste stream was overwhelmingly Municipal Solid Waste (MSW). The source of the MSW portion is primarily residential, institutional, and light commercial waste. Most of the MSW was delivered to the landfill in City of Columbia trucks.

Total waste received during the observation period was 1,791 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

Waste Stream Components

| MSW       | Const.   | Demo     | Industrial | Other   |
|-----------|----------|----------|------------|---------|
| 58%       | 7%       | 14%      | 18%        | 3%      |
| 1035 tons | 133 tons | 246 tons | 325 tons   | 52 tons |

## Municipal Solid Waste - 1,035 Tons

Municipal Solid Waste (MSW) accounted for 58% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally contained within plastic bags. However, the City of Columbia and the University of Missouri

conducted four seasonal waste sorts of MSW at the landfill in 1996. The materials were sorted and recorded by weight. Further details are available through the City of Columbia Sanitation Department.

The total MSW received during the observation period was 1,035 tons. The average percentage of each major material category found in the 1996waste sorts was applied to the tonnage received during the observation period and is displayed below.

**Municipal Solid Waste Components** 

| Paper    | Glass   | Metals  | Plastics | Organics | Inorganics |
|----------|---------|---------|----------|----------|------------|
| 41.690   | 3.7%    | 5.3%    | 12.5%    | 28.2%    | 8.7%       |
| 431 June | 38 tons | 55 tons | 129 tons | 292 tons | 90 tons    |

## Construction Waste - 133 Tons

About 7.4% of the total waste received was from new construction sources. Construction waste loads are typically transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Only two roll-off trucks delivered construction waste during the observation period. One was primarily masonry materials (bricks, concrete blocks, and gravel). The other was a combination of wood dry wall and cardboard.

Total construction waste received during the observation period was 133tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

| Construction Waste Components |          |         |        |        |         |         |
|-------------------------------|----------|---------|--------|--------|---------|---------|
| Wood                          | Dry Wall | Masonry | Metal  | Plas.  | Cardbrd | Other   |
| 53%                           | 18%      | 5%      | 3%     | 3%%    | 9%      | 10%     |
| 71 tons                       | 24 tons  | 6 tons  | 4 tons | 4 tons | 12 tons | 13 tons |

## **Demolition Waste - 246 Tons**

About 13.7% of the total waste was from demolition sources. Demolition waste loads are usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. However at this landfill most demolition materials were received in the transfer trailers and those materials were estimated an recorded as part of the demolition component. Most roofing waste loads were delivered to the landfill by independent contractors and were not mixed with other materials. The remaining demolition loads contained more mixed materials. The other category was primarily insulation board from roof tear-offs.

Total demolition waste received during the observation period was 246 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed on the next page.

## The Demolition Waste Component

| Wood    | Dry Wall | Roof    | Masonry | Metal  | Carpet | Other   |
|---------|----------|---------|---------|--------|--------|---------|
| 30%     | 9%       | 27%     | 22%     | 3%     | 2%     | 7%      |
| 74 tons | 21 tons  | 67 tons | 53 tons | 8 tons | 6 tons | 17 tons |

## **Industrial Waste - 325 Tons**

About 18.1% of the total waste was from industrial sources. The overwhelming majority of industrial waste was delivered in open top roll offs, or compactor units and in most cases it was delivered in City of Columbia trucks. Cardboard came from a variety of manufacturers. Most wood was in the form of pallets and crates.

Total industrial waste received during the observation period was 325 tons. The materials within the industrial waste component were estimated as they were unloaded. These estimated materials are listed below.

## The Industrial Waste Component

| Cardbrd | Paper   | Food    | Metal  | Wood    | Plas.   | Tex.   | Rbr.    | Other   |
|---------|---------|---------|--------|---------|---------|--------|---------|---------|
| 29%     | 6%      | 8%      | 1%     | 17%     | 26%     | 1%     | 4%      | 9%      |
| 95 tons | 21 tons | 26 tons | 2 tons | 54 tons | 83 tons | 4 tons | 11 tons | 30 tons |

## Other Waste - 52 Tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items were the only other waste observed. They include furniture, mattresses, appliances, bicycles, etc. Most of these bulky items were received in self-haul vehicles. The "other" waste was mainly organic materials (hay and straw) which were mixed with animal manure and under DNR regulations could not be composted.

Total other waste received during the observation period was 52 tons. The materials within the other waste stream were estimated as they were unloaded. These estimated materials are listed below.

## The Other Waste Component

| Bulky Items | Other   |
|-------------|---------|
| 60%         | 40%     |
| 31tons      | 21 tons |

## CITY OF COLUMBIA LANDFILL 125,867 TONS IN 1998

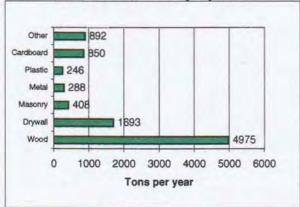
| MATERIAL                 | Tons received during observation period | Percent of each<br>material received | Estimated received in |             |
|--------------------------|---|--------------------------------------|-----------------------|-------------|
| MSW Component            | 2377 2370 4 10 10 11                    |                                      | based on              | observation |
| Paper                    | 431 Tons                                | 24.1%                                | 30,285                | Tons        |
| Glass                    | 38.3 Tons                               | 2.1%                                 |                       | Tons        |
| Metals                   | 54.9 Tons                               | 3.1%                                 |                       | Tons        |
| Plastics                 | 129 Tons                                | 7.2%                                 |                       | Tons        |
| Organics                 | 292 Tons                                | 16.3%                                | 20,518                |             |
| Inorganics               | 90 Tons                                 | 5.0%                                 |                       | Tons        |
| TOTAL MSW                | 1035 Tons                               | 57.8%                                | 72,739                |             |
| Construction Waste       |   |                                      |                       |             |
| Wood                     | 71 Tons                                 | 4.0%                                 | 4,975                 | Tons        |
| Dry Wall                 | 24 Tons                                 | 1.3%                                 | 1,693                 | Tons        |
| Masonry                  | 6 Tons                                  | 0.3%                                 | 408                   | Tons        |
| Metal                    | 4 Tons                                  | 0.2%                                 | 288                   | Tons        |
| Plastic                  | 4 Tons                                  | 0.2%                                 | 246                   | Tons        |
| Cardboard                | 12 Tons                                 | 0.7%                                 | 850                   | Tons        |
| Other                    | 13 Tons                                 | 0.7%                                 | 892                   | Tons        |
| TOTAL CONSTRUCTION       | 133 Tons                                | 7.4%                                 | 9,352                 | Tons        |
| Demolition Waste         |   |                                      |                       |             |
| Wood                     | 74 Tons                                 | 4.1%                                 | 5,200                 | Tons        |
| Dry Wall                 | 21 Tons                                 | 1.1%                                 | 1,440                 | Tons        |
| Roofing                  | 67 Tons                                 | 3.8%                                 | 4,722                 | Tons        |
| Masonry                  | 53 Tons                                 | 3.0%                                 |                       | Tons        |
| Metal                    | 8 Tons                                  | 0.5%                                 |                       | Tons        |
| Carpet                   | 6 Tons                                  | 0.3%                                 |                       | Tons        |
| Other                    | 17 Tons                                 | 1.0%                                 | 1,209                 | Tons        |
| TOTAL DEMOLITION         | 246 Tons                                | 13.7%                                | 17,285                | Tons        |
| Industrial Waste         |   |                                      |                       |             |
| Cardboard                | 95 Tons                                 | 5.3%                                 |                       | Tons        |
| Paper                    | 21 Tons                                 | 1.2%                                 |                       | Tons        |
| Food                     | 26 Tons                                 | 1.4%                                 |                       | Tons        |
| Metal                    | 2 Tons                                  | 0.1%                                 | 155                   | Tons        |
| Wood                     | 54 Tons                                 | 3.0%                                 | 3,787                 |             |
| Plastic                  | 83 Tons                                 | 4.6%                                 | 5,818                 |             |
| Textiles                 | 4 Tons                                  | 0.2%                                 |                       | Tons        |
| Rubber                   | 11 Tons                                 | 0.6%                                 |                       | Tons        |
| Other                    | 30 Tons                                 | 1.7%                                 | 2,101                 |             |
| TOTAL INDUSTRIAL         | 325 Tons                                | 18.1%                                | 22,815                | Tons        |
| Other wastes             |   |                                      |                       |             |
| Bulky Items              | 31 Tons                                 | 1.7%                                 | 2,185                 | Tons        |
| Soil and Inert Materials | 0 Tons                                  | 0.0%                                 | -                     | Tons        |
| Asbestos                 | 0 Tons                                  | 0.0%                                 |                       | Tons        |
| Other                    | 21 Tons                                 | 1.2%                                 | 1,490                 | Tons        |
| TOTAL OTHER WASTE        | 52 Tons                                 | 2.9%                                 | 3,675                 | Tons        |
| TOTAL WASTE STREAM       | 1791 Tons                               | 100%                                 | 125,867               | Tons        |

## The City of Columbia Landfill

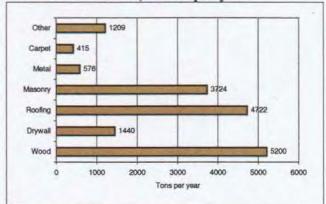
Total Waste Component -125,867 tons per year



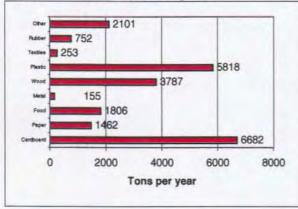




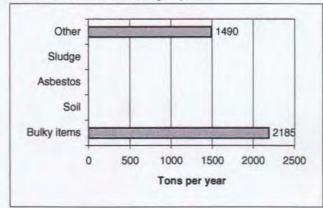
Demolition Waste - 17,285 tons per year



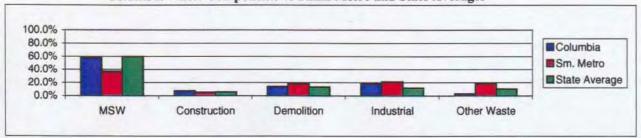
Industrial Waste - 22,815 tons per year



Other Waste - 3,675 tons per year



Columbia Waste Components vs Small Metro and State Averages



## The City of St. Joseph Landfill

The City of St. Joseph Landfill is located in Buchanan County, MO., approximately 10 miles southeast of St. Joseph, MO. It is owned and operated by The City of St. Joseph. The disposal facility covers is permitted to accept all municipal solid waste (MSW) and some other wastes such as contaminated soils, asbestos, and wastewater treatment sludge. The City of St. Joseph also operates a yard waste composting operation at the same facility. The City of St. Joseph does not collect waste in the City. The residential and commercial waste collection service is contracted Deffenbaugh Industries and taken to their disposal facility in Kansas.

The City of St. Joseph Landfill accepted 98,940 tons in 1996, 99,285 tons in 1997 and 120,158 tons in 1998. The landfill operation was observed from Monday November 9<sup>h</sup> through Friday November 13<sup>th</sup>. The weather was rainy and very windy during the first part of the week and fair the remainder of the week. Observation took place from 7 AM till 4:30 PM on the above dates. During the observation period, 667 trucks, delivered 2109 tons of waste to the landfill. All loads were observed and recorded. The landfill staff felt the material received during the observation period was not typical of material received year round because of two large projects, which tended to skew the results of the demolition and other waste stream components. Therefore the results may not be as accurate as desired.

Each driver was asked where the load originated. This was done to determine in what classification (MSW, construction, demolition, industrial, or other) the load should be recorded. However, most loads could be classified visually, without any driver data.

The City of St. Joseph Landfill accepts waste from Andrew, Buchanan, Clay, Clinton, DeKalb, counties. The nearest Missouri landfill are located in Maryville and Sugar Creek, Missouri. There are several landfills in Kansas, which accept waste from the area. There was a large amount of small self-haul traffic. There were no waste loads from transfer stations.

## The Total Waste Stream - 2,084 tons

The total waste stream was very different than most comparable landfills. The Municipal Solid Waste (MSW) was very low because all of the St. Joseph MSW is contracted to Deffenbaugh Ind. And taken to their Kansas disposal facility. There were greater percentages of demolition, industrial and other waste than the rural areas. Total waste received during the observation period was 2,084 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

| MSW      |        |          |            |          |
|----------|--------|----------|------------|----------|
|          | Const. | Demo     | Industrial | Other    |
| 25%      | 4%     | 21%      | 23%        | 27%      |
| 523 tons | 76tons | 436 tons | 478 tons   | 570 tons |

## **Municipal Solid Waste - 523 tons**

Municipal Solid Waste (MSW) accounted for only 25% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally contained within plastic bags. However, three MSW sorts were conducted at the St. Joseph Landfill in 1996. During the three waste sorts 30 samples, weighing an average of 239 pounds each, were examined. Each of these samples were hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and volume. Further details are available in the Missouri Waste Composition Study: Municipal Solid Waste.

The total MSW received during the observation period was 523 tons. The percentage of each major material category found in the 1996 sort was applied to the tonnage received during the observation period and is displayed below.

#### Municipal Solid Waste Components

| Paper    | Glass   | Metals  | Plastics | Organics | Inorganics |
|----------|---------|---------|----------|----------|------------|
| 39.6%    | 6.4%    | 7.2%    | 12.7%    | 29.4%    | 4.1%       |
| 208 tons | 34 tons | 38 tons | 67 tons  | 155 tons | 22 tons    |

## Construction Waste - 76 tons

About 4% of the total waste received was from new construction sources. Construction waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. This percentage was greater than most of the rural areas but less than urban landfills in the state. The construction loads tended to be lighter, less weathered, more homogeneous (all wood, dry wall, etc), and contained more cardboard boxes (usually from fixtures) than the demolition waste loads.

Total construction waste received during the observation period was 76 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

|      |          | Constructi |       |       |         |
|------|----------|------------|-------|-------|---------|
| Wood | Dry Wall | Masonry    | Metal | Plas. | Cardbrd |
| 10%  | 220%     | 200%       | 20%   | 1.0%  | 10%     |

Other 1% 31 tons 17 tons 23 tons 2 tons 1 ton 3 tons 1 ton

## **Demolition Waste - 436 tons**

About 21% of the total waste was from demolition sources. This was a very high percentage, which resulted from a large demolition project in Pattonsburg, Missouri. During the Observation period 25 trucks from the Pattonsburg project delivered 234 (51%) tons of demolition waste to the landfill. Therefore, this one time project doubled the normal demolition waste. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. The wood was more weathered, there was very little if any

cardboard, and there was more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste as compared to the construction waste.

Total demolition waste received during the observation period was 436 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed below.

#### The Demolition Waste Component

| Wood     | Dry Wall | Roof    | Masonry | Metal  | Carpet  | Other  |
|----------|----------|---------|---------|--------|---------|--------|
| 53%      | 4%       | 18%     | 18%     | 1%     | 4%      | 1%     |
| 233 tons | 19 tons  | 80 tons | 79 tons | 5 tons | 17 tons | 4 tons |

## Industrial Waste - 478 tons

St. Joseph has a large industrial base and therefore the industrial waste stream was significantly higher (23% of the total waste stream) than many other areas of the state. Industrial waste loads were usually transported to the landfill in open top roll-off containers or compactor units. They were normally homogeneous, containing a single waste products from a manufacturing process. There were 102 loads (15% of the total) that contained some industrial waste. These loads came from a variety of sources. The main industrial generators were Blueside, Ralston (Friskies), Johnson Control, Quaker Corp., Snorkel, and Silgan. Altec and Atchison Castings. The remaining industrial waste was from smaller generators.

Total industrial waste received during the observation period was 478 tons. The materials within the industrial waste stream were estimated as they were unloaded. These estimated materials are listed below.

#### The Industrial Waste Component

| Cardbrd | Paper   | Food     | Metal   | Wood    | Plas.   | Tex.   | Rbr.   | Other   |
|---------|---------|----------|---------|---------|---------|--------|--------|---------|
| 15%     | 9%      | 35%      | 4%      | 16%     | 6%      | 0%     | 0%     | 15%     |
| 72 tons | 44 tons | 168 tons | 18 tons | 75 tons | 27 tons | 0 tons | 0 tons | 73 tons |

## Other Waste - 570 tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items include furniture, mattresses, appliances, etc.. The big surprise in other waste was the amount of dirt brought to the landfill. The dirt came from three main sources. The City of St. Joseph Street Department 142 tons, a highway project in Hopkins, MO. 315 tons, and a construction project in St. Joseph 74 tons.

Total other waste received during the observation period was 570 tons. The materials within the other waste stream were estimated as they were unloaded. These estimated materials are listed below.

#### The Other Waste Component

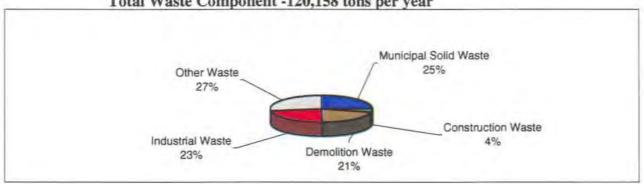
| Bulky   | Soil     | Asbestos |
|---------|----------|----------|
| 5%      | 93%      | 2%       |
| 27 tons | 531 tons | 13 tons  |

# CITY OF ST. JOSEPH LANDFILL 120,158 TONS IN 1998

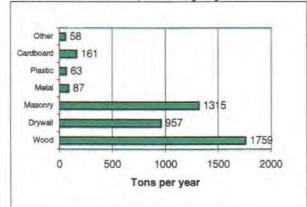
| MATERIAL                 |           |       | Estimated received i |             |
|--------------------------|-----------|-------|----------------------|-------------|
| MSW Component            |           |       |                      | observation |
| Paper                    | 208 Tons  | 10.0% | 11,995               | Tons        |
| Glass                    | 34 Tons   | 1.6%  | 1,943                | Tons        |
| Metals                   | 38 Tons   | 1.8%  | 2,186                | Tons        |
| Plastics                 | 67 Tons   | 3.2%  |                      | Tons        |
| Organics                 | 155 Tons  | 7.4%  | 2012                 | Tons        |
| Inorganics               | 22 Tons   | 1.0%  |                      | Tons        |
| TOTAL MSW                | 523 Tons  | 25.1% | 30,161               | Tons        |
| Construction Waste       |           |       |                      |             |
| Wood                     | 31 Tons   | 1.5%  | 1,759                | Tons        |
| Dry Wall                 | 17 Tons   | 0.8%  | 957                  | Tons        |
| Masonry                  | 23 Tons   | 1.1%  | 1,315                | Tons        |
| Metal                    | 2 Tons    | 0.1%  | 87                   | Tons        |
| Plastic                  | 1 Tons    | 0.1%  | 63                   | Tons        |
| Cardboard                | 3 Tons    | 0.1%  | 161                  | Tons        |
| Other                    | 1 Tons    | 0.0%  |                      | Tons        |
| TOTAL CONSTRUCTION       | 76 Tons   | 3.7%  | 4,400                | Tons        |
| Demolition Waste         |           |       |                      |             |
| Wood                     | 233 Tons  | 11.2% | 13,437               | Tons        |
| Dry Wall                 | 19 Tons   | 0.9%  | 1,119                | Tons        |
| Roofing                  | 80 Tons   | 3.8%  | 4,585                | Tons        |
| Masonry                  | 79 Tons   | 3.8%  | 4,527                | Tons        |
| Metal                    | 5 Tons    | 0.2%  | 294                  | Tons        |
| Carpet                   | 17 Tons   | 0.8%  | 963                  | Tons        |
| Other                    | 4 Tons    | 0.2%  | 242                  | Tons        |
| TOTAL DEMOLITION         | 436 Tons  | 20.9% | 25,167               | Tons        |
| Industrial Waste         |           |       |                      |             |
| Cardboard                | 72 Tons   | 3.5%  |                      | Tons        |
| Paper                    | 44 Tons   | 2.1%  | 2,560                | Tons        |
| Food                     | 168 Tons  | 8.1%  |                      | Tons        |
| Metal                    | 18 Tons   | 0.9%  | 1,044                | Tons        |
| Wood                     | 75 Tons   | 3.6%  | 4,308                |             |
| Plastic                  | 27 Tons   | 1.3%  | 1,569                |             |
| Textiles                 | 0 Tons    | 0.0%  |                      | Tons        |
| Rubber                   | 0 Tons    | 0.0%  | -                    | Tons        |
| Other                    | 73 Tons   | 3.5%  | 4,198                |             |
| TOTAL INDUSTRIAL         | 478 Tons  | 22.9% | 27,537               | Tons        |
| Other Waste              |           |       |                      |             |
| Bulky Items              | 27 Tons   | 1.3%  | 1,569                | Tons        |
| Soil and Inert Materials | 530 Tons  | 25.4% | 30,564               |             |
| Asbestos                 | 13 Tons   | 0.6%  | 761                  | Tons        |
| Other                    | 0 Tons    | 0.0%  | -                    | Tons        |
| TOTAL OTHER WASTE        | 570 Tons  | 27.4% | 32,894               | Tons        |
| TOTAL WASTE STREAM       | 2084 Tons | 100%  | 120,158              | Tons        |
|                          |           |       |                      |             |

## The City of St. Joseph Landfill

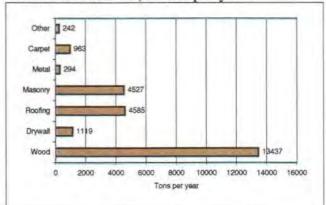
Total Waste Component -120,158 tons per year



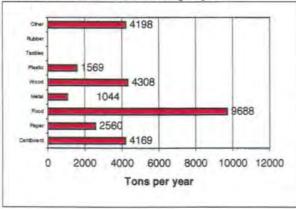




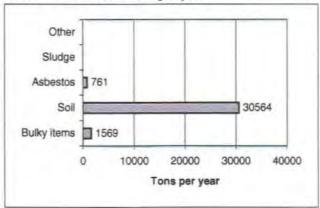
#### Demolition Waste - 25,167 tons per year



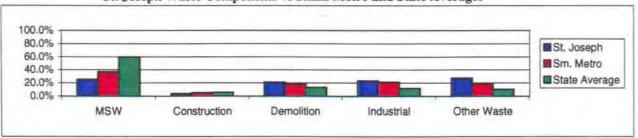
#### Industrial Waste - 27,537 tons per year



#### Other Waste - 32,894 tons per year



#### St. Joseph Waste Components vs Small Metro and State Averages



# **Courtney Ridge Landfill**

The Courtney Ridge Landfill is located in Sugar Creek, MO., approximately 20 miles northwest of Kansas City, MO. It is owned and operated by Waste Management Inc. The disposal facility covers 134 acres and is permitted to accept all municipal solid waste (MSW) and some Other wastes such as asbestos, contaminated soils and waste water treatment sludge.

The Courtney Ridge Landfill accepted 59,332 tons in 1996, 315,951 tons in 1997 and 418,625 tons in 1998. The landfill operation was observed from Monday February 8<sup>th</sup> through Friday February 12<sup>th</sup>, 1999. The weather was fair for the first three days but rained and turned cold on Thursday and Friday. Observation took place from 7 AM till 5:00 PM on the above dates. The Courtney Ridge Landfill is open 24 hours a day and therefore not all trucks were observed. During the five-day period 733 trucks, delivered 4,350 tons of waste to the landfill were observed. The landfill staff felt the material received during the observation period was typical of material received year round.

Due to the heavy traffic and small dumping area drivers were not asked where the loads originated. However, all loads could be classified visually, without any driver data.

## The Total Waste Stream - 4,350

The total waste stream was predominately Municipal Solid Waste (MSW). The source of the MSW portion is primarily residential, institutional, and light commercial waste. The MSW was delivered to the landfill in local packer trucks.

Total waste received during the observation period was 4,350 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

#### **Waste Stream Components**

| MSW       | Const.   | Demo     | Industrial | Other    |
|-----------|----------|----------|------------|----------|
| 59%       | 5%       | 7%       | 20%        | 9%       |
| 2571 tons | 209 tons | 304 tons | 870 tons   | 397 tons |

## Municipal Solid Waste - 2571 tons

Municipal Solid Waste (MSW) accounted for 59% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally contained within plastic bags. However, MSW was sorted and recorded at 19 landfills and transfer stations as part of this study in 1996 and 97. During the 56 sorts 632 samples, weighing an average of 222 pounds each, were examined. Each of these samples were hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and

volume. Further details are available in the Missouri Waste Composition Study: Municipal Solid Waste.

The total MSW received during the observation period was 2571 tons. The average percentage of each major material category found in the 1996-97 waste sorts was applied to the tonnage received during the observation period and is displayed below.

Municipal Solid Waste Components

| Paper    | Glass    | Metals   | Plastics | Organics | Inorganics |
|----------|----------|----------|----------|----------|------------|
| 37.3%    | 5.8%     | 6.9%     | 14.4%    | 30.8%    | 4.8%       |
| 959 tons | 149 tons | 177 tons | 370 tons | 792 tons | 123 tons   |

## Construction Waste - 209 tons

About 5% of the total waste received was from new construction sources. Construction waste loads were transported to the landfill in open top roll-off containers, dump trucks, or open trailers.. The construction loads tended to be lighter, less weathered, and more homogeneous (all wood and dry wall).

Total construction waste received during the observation period was 209 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

| Construction Waste Components |          |         |        |         |           |         |  |
|-------------------------------|----------|---------|--------|---------|-----------|---------|--|
| Wood                          | Dry Wall | Masonry | Metal  | Plas.   | Cardboard | 1 Other |  |
| 52%                           | 21%      | 6%      | 2%     | 8%      | 10%       | 0%      |  |
| 108 tons                      | 44 tons  | 14 tons | 4 tons | 17 tons | 22 tons   | 0 tons  |  |

#### Demolition Waste - 304 tons

About 7% of the total waste was from demolition sources. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Roofing waste was typically delivered to the landfill by independent contractors and was not mixed with other materials. The remaining demolition loads contained more mixed materials. The wood was more weathered, there was very little if any cardboard, and there was more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste as compared to the construction waste.

Total demolition waste received during the observation period was 304 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed on the next page.

| TIL. | D    | 1:45   | XX7 4 - | C         |
|------|------|--------|---------|-----------|
| I ne | Demo | iition | waste   | Component |

| Wood     | Dry Wall | Roof    | Masonry | Metal   | Carpet  | Other   |
|----------|----------|---------|---------|---------|---------|---------|
| 35%      | 9%       | 23%     | 8%      | 9%      | 8%      | 8%      |
| 106 tons | 28 tons  | 70 tons | 26tons  | 27 tons | 24 tons | 24 tons |

### **Industrial Waste -870 tons**

Industrial waste loads were usually transported to the landfill in open top roll-off containers or compactor units. They were normally homogeneous, containing a single waste products from a manufacturing process. There were two main industrial generators. The materials in the "other" category listed below were primarily a sludge product from a manufacturer.

Total industrial waste received during the observation period was 870 tons. The materials within the industrial waste stream were estimated as they were unloaded. These estimated materials are listed below.

#### The Industrial Waste Component

| Cardbrd  | Paper   | Food     | Metal  | Wood     | Plas.   | Tex.   | Rbr.   | Other   |
|----------|---------|----------|--------|----------|---------|--------|--------|---------|
| 22%      | 8%      | 34%      | 0%     | 22%      | 5%      | 0%     | 0%     | 9%      |
| 189 tons | 71 tons | 300 tons | 2 tons | 192 tons | 41 tons | 0 tons | 0 tons | 75 tons |

### Other Waste - 397 tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items include furniture, mattresses, appliances, etc. Most of these bulky items were received in open top roll-off containers.

Total Other waste received during the observation period was 397 tons. The materials within the Other waste stream were estimated as they were unloaded. These estimated materials are listed below.

#### The Other Waste Component

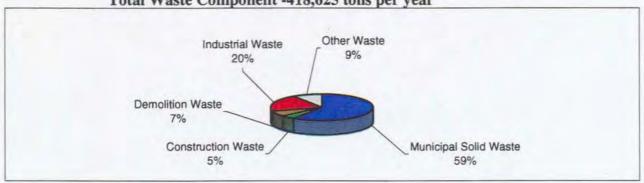
| <b>Bulky Items</b> | Sewage Sludge | Soil    | Ash     |
|--------------------|---------------|---------|---------|
| 35%                | 37%           | 23%     | 4%      |
| 139 tons           | 148 tons      | 93 tons | 17 tons |

# COURTNEY RIDGE LANDFILL 418,625 TONS IN 1998

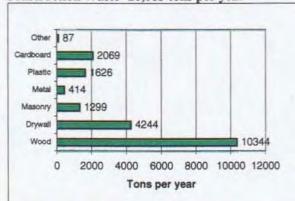
| MATERIAL                 | Tons received during observation period | Percent of each<br>material received | Estimated received in | tonnage<br>in 1998 |
|--------------------------|---|--------------------------------------|-----------------------|--------------------|
| MSW Component            | ,                                       |                                      | based on              | observation        |
| Paper                    | 939 Tons                                | 21.6%                                | 90.357                | Tons               |
| Glass                    | 149 Tons                                | 3.4%                                 |                       | Tons               |
| Metals                   | 177 Tons                                | 4.1%                                 |                       | Tons               |
| Plastics                 | 370 Tons                                | 8.5%                                 |                       | Tons               |
| Organics                 | 792 Tons                                | 18.2%                                |                       | Tons               |
| Inorganics               | 123 Tons                                | 2.8%                                 |                       | Tons               |
| TOTAL MSW                | 2571 Tons                               | 59.1%                                |                       | Tons               |
| Construction Waste       |   |                                      |                       |                    |
| Wood                     | 108 Tons                                | 2.5%                                 | 10,344                | Tons               |
| Dry Wall                 | 44 Tons                                 | 1.0%                                 | 4,244                 | Tons               |
| Masonry                  | 14 Tons                                 | 0.3%                                 | 1,299                 | Tons               |
| Metal                    | 4 Tons                                  | 0.1%                                 | 414                   | Tons               |
| Plastic                  | 17 Tons                                 | 0.4%                                 |                       | Tons               |
| Cardboard                | 22 Tons                                 | 0.5%                                 |                       | Tons               |
| Other                    | 1 Tons                                  | 0.0%                                 |                       | Tons               |
| TOTAL CONSTRUCTION       | 209 Tons                                | 4.8%                                 | 20,083                |                    |
| Demolition Waste         |   |                                      |                       |                    |
| Wood                     | 106 Tons                                | 2.4%                                 | 10,162                | Tons               |
| Dry Wall                 | 28 Tons                                 | 0.6%                                 | 2,665                 | Tons               |
| Roofing                  | 70 Tons                                 | 1.6%                                 | 6,697                 | Tons               |
| Masonry                  | 26 Tons                                 | 0.6%                                 | 2,483                 | Tons               |
| Metal                    | 27 Tons                                 | 0.6%                                 | 2,589                 | Tons               |
| Carpet                   | 24 Tons                                 | 0.5%                                 | 2,281                 | Tons               |
| Other                    | 24 Tons                                 | 0.6%                                 | 2,329                 | Tons               |
| TOTAL DEMOLITION         | 304 Tons                                | 7.0%                                 | 29,205                | Tons               |
| Industrial Waste         |   |                                      |                       |                    |
| Cardboard                | 189 Tons                                | 4.3%                                 | 18,139                |                    |
| Paper                    | 71 Tons                                 | 1.6%                                 | 6,813                 | Tons               |
| Food                     | 300 Tons                                | 6.9%                                 | 28,849                | Tons               |
| Metal                    | 2 Tons                                  | 0.0%                                 | 173                   | Tons               |
| Wood                     | 193 Tons                                | 4.4%                                 | 18,533                |                    |
| Plastic                  | 41 Tons                                 | 0.9%                                 | 3,955                 | Tons               |
| Textiles                 | 0 Tons                                  | 0.0%                                 |                       |                    |
| Rubber                   | 0 Tons                                  | 0.0%                                 |                       |                    |
| Other                    | 76 Tons                                 | 1.7%                                 | 7,284                 |                    |
| TOTAL INDUSTRIAL         | 870 Tons                                | 20.0%                                | 83,746                | Tons               |
| Other Waste              |   |                                      |                       |                    |
| Bulky Items              | 139 Tons                                | 3.2%                                 | 13,347                |                    |
| Soil and Inert Materials | 93 Tons                                 | 2.1%                                 | 8,939                 | Tons               |
| Sludge                   | 148 Tons                                | 3.4%                                 | 14,251                | Tons               |
| Other                    | 17 Tons                                 | 0.4%                                 |                       | Tons               |
| TOTAL OTHER WASTE        | 397 Tons                                | 9.1%                                 | 38,192                | Tons               |
| TOTAL WASTE STREAM       | 4350 Tons                               | 100%                                 | 418,625               | Tons               |
|                          |   |                                      |                       |                    |

## The Courtney Ridge Landfill

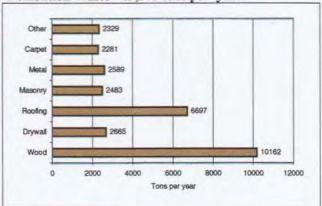
Total Waste Component -418,625 tons per year



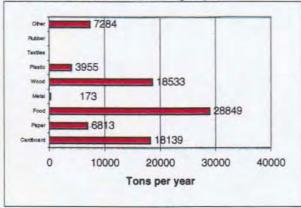
Construction Waste -20,083 tons per year



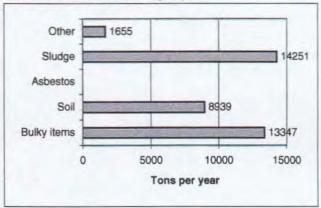
Demolition Waste - 29,205 tons per year



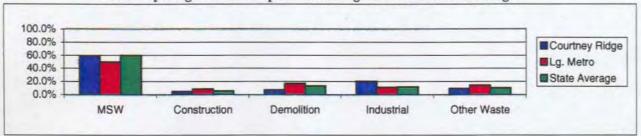
Industrial Waste - 83,746 tons per year



Other Waste - 38,192 tons per year



Courtney Ridge Waste Components vs Large Metro and State Averages



## Fred Weber Inc. Landfill

The Fred Weber Landfill is located in St. Louis County approximately 15 miles west of the City of St. Louis, MO. It is owned and operated by Fred Weber Inc. The disposal facility covers 70 acres and is permitted to accept all municipal solid waste (MSW) and some Other wastes.

The Fred Weber Landfill accepted 59,332 tons in 1996, 315,951 tons in 1997 and 321,269 tons in 1998. The landfill operation was observed from Tuesday March 30<sup>th</sup> through Friday April 2<sup>nd</sup>, 1999. The weather was fair for the entire observation period. Observation took place from 7 AM till 4:30 PM on the above dates. During the four-day observation period 797 trucks, delivered 3,040 tons of waste to the landfill.

Because the weather was fair, and the observation period coincided with Easter week break, there may have been a slight increase in bulky items and brush. Other than that possibility the landfill staff felt the material received during the observation period was typical of material received year round.

Due to the heavy traffic and small dumping area drivers were not asked where the loads originated. However, all loads could be classified visually, without any driver data.

### The Total Waste Stream - 3,040 tons

The composition of waste received at the Fred Weber Landfill has changed over the past year, and probably will continue to change during future months, due to consolidations, mergers, buyouts and hauler-related ownership of the landfills in the St. Louis region. The Fred Weber Landfill is not owned by a waste hauling company. However, the remaining two sanitary landfills in the St. Louis region are owned by national waste hauling companies. Based on the waste received during the observation period the Fred Weber Landfill presently seems to attract construction and demolition haulers, small independents, and self haul vehicles. The MSW waste component was lower than most sanitary landfills throughout the state.

Total waste received during the observation period was 3,040 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

| 5115 8 |       | Waste Stream | Components |  |
|--------|-------|--------------|------------|--|
| MCW    | Const | Domo         | Industri   |  |

| MSW      | Const.   | Demo      | Industrial | Other    |
|----------|----------|-----------|------------|----------|
| 31%      | 16%      | 34%       | 7%         | 12%      |
| 948 tons | 486 tons | 1047 tons | 206 tons   | 353 tons |

## Municipal Solid Waste - 948 tons

Municipal Solid Waste (MSW) accounted for 31% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally

contained within plastic bags. However, MSW was sorted and recorded at 19 landfills and transfer stations as part of this study in 1996 and 97. During the 56 sorts 632 samples, weighing an average of 222 pounds each, were examined. Each of these samples were hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and volume. Further details are available in the *Missouri Waste Composition Study: Municipal Solid Waste*.

The total MSW received during the observation period was 948 tons. The average percentage of each major material category found in the 1996-97 waste sorts was applied to the tonnage received during the observation period and is displayed below.

#### **Municipal Solid Waste Components**

| Paper    | Glass   | Metals  | Plastics | Organics | Inorganics |
|----------|---------|---------|----------|----------|------------|
| 37.3%    | 5.8%    | 6.9%    | 14.4%    | 30.8%    | 4.8%       |
| 354 tons | 55 tons | 65 tons | 137 tons | 292 tons | 45 tons    |

### **Construction Waste - 486 Tons**

About 16% of the total waste received was from new construction sources. Construction waste loads were transported to the landfill in open top roll-off containers, dump trucks, or open trailers. The construction loads tended to be lighter, less weathered, and more homogeneous (all wood or dry wall, etc.) than demolition loads.

Total construction waste received during the observation period was 486 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

#### **Construction Waste Components**

| Wood     | Dry Wall | Masonry | Metal  | Plas.   | Cardboar | d Other |
|----------|----------|---------|--------|---------|----------|---------|
| 48%      | 26%      | 8%      | 1%     | 4%      | 9%       | 4%      |
| 232 tons | 125 tons | 41 tons | 6 tons | 17 tons | 43 tons  | 22 tons |

#### **Demolition Waste - 1047 Tons**

About 34% of the total waste was from demolition sources. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Roofing waste was typically delivered to the landfill by independent contractors and was not mixed with other materials. The remaining demolition loads contained more mixed materials. The wood was more weathered, there was very little if any cardboard, and there was more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste as compared to the construction waste. The "other" category was primarily roofing insulation board from commercial roofs.

Total demolition waste received during the observation period was 1047 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed on the next page.

#### The Demolition Waste Component

| Wood     | Dry Wall | Roof     | Masonry | Metal   | Carpet  | Other   |
|----------|----------|----------|---------|---------|---------|---------|
| 26%      | 5%       | 23%      | 29%     | 5%      | 4%      | 7%      |
| 272 tons | 55 tons  | 245 tons | 303tons | 55 tons | 40 tons | 77 tons |

#### Industrial Waste - 206 Tons

Industrial waste loads were usually transported to the landfill in open top roll-off containers or compactor units. They were normally homogeneous, containing a single waste products from a manufacturing process. The biggest industrial waste material was quartered tires from a tire chipping company. Much of the cardboard was from equipment installers and the wood component was primarily pallets.

Total industrial waste received during the observation period was 206 tons. The materials within the industrial waste stream were estimated as they were unloaded. These estimated materials are listed below.

#### The Industrial Waste Component

| Cardbrd | Paper   | Food   | Metal | Wood    | Plas.   | Tex.   | Rbr.    | Other  |
|---------|---------|--------|-------|---------|---------|--------|---------|--------|
| 28%     | 10%     | 0%     | 0%    | 14%     | 8%      | 1%     | 39%     | 0%     |
| 58 tons | 20 tons | 0 tons | 1 ton | 28 tons | 16 tons | 2 tons | 81 tons | 0 tons |

#### Other Waste - 353 Tons

Other waste is defined as waste which does not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items include furniture, mattresses, appliances, etc. Most of these bulky items were received in open top roll-off containers from clean-up operations or delivered on small self-haul trucks and trailers. The brush was unloaded at the compost area if it was clean (no trash mixed with the yard waste) or put into the main fill area if there were stumps, dirt, or other items mixed with the brush.

Total other waste received during the observation period was 353 tons. The materials within the Other waste stream were estimated as they were unloaded. These estimated materials are listed below.

### The Other Waste Component

| <b>Bulky Items</b> | Brush, Stumps, or Commercial Yard Waste |
|--------------------|---|
| 36%                | 64%                                     |
| 128 tons           | 225 tons                                |

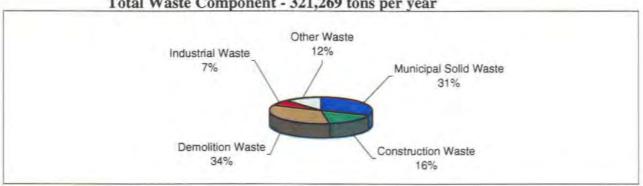
## FRED WEBER LANDFILL

# 321,269 TONS IN 1998

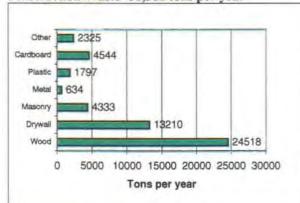
| MATERIAL                 | Tons received during | Percent of each   | Estimated  |             |
|--------------------------|----------------------|-------------------|------------|-------------|
|                          | observation period   | material received | received i |             |
| MSW Component            |                      | To Company        |            | observation |
| Paper                    | 354 Tons             | 11.6%             |            | Tons        |
| Glass                    | 55 Tons              | 1.8%              |            | Tons        |
| Metals                   | 65 Tons              | 2.1%              |            | Tons        |
| Plastics                 | 137 Tons             | 4.5%              |            | Tons        |
| Organics                 | 292 Tons             | 9.6%              |            | Tons        |
| Inorganics               | 45 Tons              | 1.5%              |            | Tons        |
| TOTAL MSW                | 948 Tons             | 31.2%             | 100,185    | Tons        |
| Construction Waste       |                      |                   |            |             |
| Wood                     | 232 Tons             | 7.6%              | 24,518     | Tons        |
| Dry Wall                 | 125 Tons             | 4.1%              | 13,210     | Tons        |
| Masonry                  | 41 Tons              | 1.3%              | 4,333      | Tons        |
| Metal                    | 6 Tons               | 0.2%              | 634        | Tons        |
| Plastic                  | 17 Tons              | 0.6%              | 1,797      | Tons        |
| Cardboard                | 43 Tons              | 1.4%              | 4,544      | Tons        |
| Other                    | 22 Tons              | 0.7%              | 2,325      | Tons        |
| TOTAL CONSTRUCTION       | 486 Tons             | 16.0%             | 51,361     | Tons        |
| Demolition Waste         |                      |                   |            |             |
| Wood                     | 272 Tons             | 8.9%              | 28,745     | Tons        |
| Dry Wall                 | 55 Tons              | 1.8%              |            | Tons        |
| Roofing                  | 245 Tons             | 8.1%              | 25,892     |             |
| Masonry                  | 303 Tons             | 10.0%             | 32,021     |             |
| Metal                    | 55 Tons              | 1.8%              |            | Tons        |
| Carpet                   | 40 Tons              | 1.3%              |            | Tons        |
| Other                    | 77 Tons              | 2.5%              |            | Tons        |
| TOTAL DEMOLITION         | 1047 Tons            | 34.4%             | 110,648    | Tons        |
| Industrial Waste         |                      |                   |            |             |
| Cardboard                | 58 Tons              | 1.9%              | 6.129      | Tons        |
| Paper                    | 20 Tons              | 0.7%              |            | Tons        |
| Food                     | 0 Tons               | 0.0%              |            | Tons        |
| Metal                    | 1 Tons               | 0.0%              | 106        | Tons        |
| Wood                     | 28 Tons              | 0.9%              |            | Tons        |
| Plastic                  | 16 Tons              | 0.5%              |            | Tons        |
| Textiles                 | 2 Tons               | 0.1%              |            | Tons        |
| Rubber                   | 81 Tons              | 2.7%              |            | Tons        |
| Other                    | 0 Tons               | 0.0%              |            | Tons        |
| TOTAL INDUSTRIAL         | 206 Tons             | 6.8%              | 21,770     |             |
| Other Wastes             |                      |                   |            |             |
| Bulky Items              | 128 Tons             | 4.2%              | 13,527     | Tons        |
| Soil and Inert Materials | 0 Tons               | 0.0%              |            | Tons        |
| Asbestos                 | 0 Tons               | 0.0%              | -          | Tons        |
| Commercial yard waste    | 225 Tons             | 7.4%              | 23,778     |             |
| TOTAL OTHER WASTE        | 353 Tons             | 11.6%             | 37,305     |             |
| TOTAL WASTE STREAM       | 3040 Tons            | 100%              | 321,269    | Tons        |
| TOTAL WASTE STREAM       | 0040 1013            | 10070             | 021,200    | . 0,13      |

#### The Fred Weber Landfill

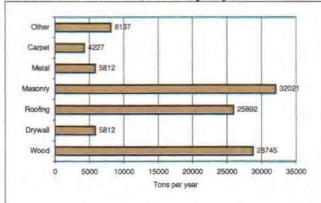
Total Waste Component - 321,269 tons per year



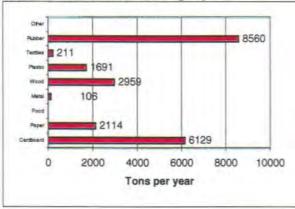
Construction Waste -51,361 tons per year



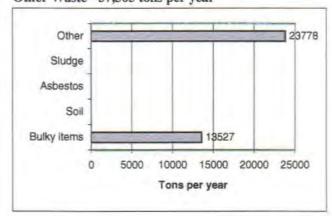
Demolition Waste -110,648 tons per year



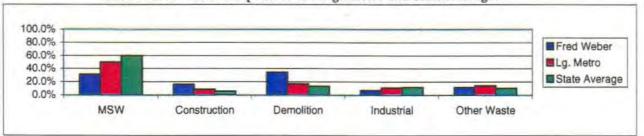
Industrial Waste - 21,770 tons per year



Other Waste - 37,305 tons per year



Fred Weber Waste Components vs Large Metro and State Averages



# Lamar Landfill

The Lamar Landfill is located in Barton County, MO., approximately 5 miles north of Lamar, MO. It is owned and operated by Browning Ferris Industries Inc. The disposal facility is permitted to accept all municipal solid waste (MSW) and some Other wastes such as contaminated soils, asbestos, and wastewater treatment sludge.

The Lamar Landfill accepted 165,010 tons in 1996, 181,147 tons in 1997 and 168,591tons in 1998. The landfill operation was observed from Monday October 19<sup>h</sup> through Friday October 23rd. The weather was sunny and fair the entire week.. Observation took place from 7 AM till 4:30 PM on the above dates. During the observation period, 197 trucks, delivered 2,769 tons of waste to the landfill. All loads were observed and recorded. The landfill staff felt the material received during the observation period was typical of material received year round.

Each driver was asked where the load originated. This was done to determine in what classification (MSW, construction, demolition, industrial, or Other) the load should be recorded. However, most loads could be classified visually, without any driver data.

The Lamar Landfill accepts waste from a six county area. The nearest Missouri landfills are located in Springfield and Clinton. Two transfer stations shipped waste to the Lamar Landfill. These were the BFI Transfer Station in Springfield, and the Stockton Transfer Station. These sources accounted for 67% (1862 tons) of the total waste received during the observation period. There were some construction, demolition, and industrial materials observed and recorded in these transfer loads but the overwhelming majority of the transfer station waste was MSW.

### The Total Waste Stream - 2,766 tons

The total waste stream was predominately Municipal Solid Waste (MSW). The source of the MSW portion is primarily residential, institutional, and light commercial waste. The MSW was delivered to the landfill in transfer trailers and local packer trucks. Total waste received during the observation period was 2,769 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

#### Waste Stream Components

| MSW       | Const.  | Demo     | Industrial | Other    |
|-----------|---------|----------|------------|----------|
| 77%       | 1%      | 7%       | 8%         | 8%       |
| 2125 tons | 19 tons | 187 tons | 227 tons   | 211 tons |

## Municipal Solid Waste - 2,122 tons

Municipal Solid Waste (MSW) accounted for 77% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally

contained within plastic bags. However, three MSW sorts were conducted at the Lamar landfill in 1996. During the three waste sorts 38 samples, weighing an average of 212 pounds each, were examined. Each of these samples were hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and volume. Further details are available in the Missouri Waste Composition Study: Municipal Solid Waste.

The total MSW received during the observation period was 2125 tons. The percentage of each major material category found in the 1996 sort was applied to the tonnage received during the observation period and is displayed below.

**Municipal Solid Waste Components** 

| Paper    | Glass    | Metals   | Plastics | Organics | Inorganics |
|----------|----------|----------|----------|----------|------------|
| 35.1%    | 4.9%     | 7.1%     | 15.5%    | 33%      | 4.3%       |
| 746 tons | 104 tons | 151 tons | 329 tons | 701 tons | 91 tons    |

### Construction Waste - 19 tons

Only about 1% of the total waste received was from new construction sources. Construction waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. The area served by the landfill is not a fast growing area and open burning is permitted in most municipalities and all counties. Both of these factors may have contributed to the low amount of construction waste. The construction loads tended to be lighter, less weathered, more homogeneous (all wood, dry wall, etc), and contained more cardboard boxes (usually from fixtures) than the demolition waste loads.

Total construction waste received during the observation period was 19 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

Construction Waste Components Wood Dry Wall Masonry Metal Plas. Cardbrd Other 51% 2% 0% 26% 4% 0% 9% 10 tons 0 tons 2 tons 0 tons 2 tons 5 tons 1 tons

#### **Demolition Waste - 187 tons**

About 7% of the total waste was from demolition sources. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Over half (54%) of the of the demolition waste was roofing shingles. Roofing waste was typically delivered to the landfill by independent contractors and was not mixed with other materials. The remaining demolition loads contained more mixed materials. The wood was more weathered, there was very little if any cardboard, and there was more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste as compared to the construction waste. Total demolition waste received during the observation period was 187 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed on the next page.

| The Demolition | Waste | Component |
|----------------|-------|-----------|
|----------------|-------|-----------|

| Wood    | Dry Wall | Roof     | Masonry | Metal  | Carpet  | Other   |
|---------|----------|----------|---------|--------|---------|---------|
| 25%     | 2%       | 54%      | 3%      | 4%     | 6%      | 6%      |
| 46 tons | 4 tons   | 101 tons | 5 tons  | 7 tons | 11 tons | 11 tons |

#### Industrial Waste - 413 tons

Industrial waste loads were usually transported to the landfill in open top roll-off containers or compactor units. They were normally homogeneous, containing a single waste products from a manufacturing process. These loads came from a variety of sources. Sludge and foundry sand constituted the largest waste. During the observation period the Lamar Landfill received 178 tons of foundry sand. This sand was not hazardous and was normally dumped to the side and spread over the normal waste as time permitted. Approximately 8 tons of a black carbon char was received and was handled similar to the foundry sand. Aluminum sludge (65 tons) was transported from the BFI Transfer Station in Springfield and mixed with the MSW. The remaining industrial waste was from smaller generators.

Total industrial waste received during the observation period was 413 tons. The materials within the industrial waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Industrial Waste Component

| Cardbrd | Paper   | Food   | Metal   | Wood    | Plas.   | Tex.    | Rbr.   | Sludge   |
|---------|---------|--------|---------|---------|---------|---------|--------|----------|
| 15%     | 2%      | 0%     | 4%      | 5%      | 5%      | 5%      | 2%     | 61%      |
| 62 tons | 10 tons | 0 tons | 18 tons | 20 tons | 19 tons | 22 tons | 9 tons | 253 tons |

#### Other Waste - 26 tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items include furniture, mattresses, appliances, etc.. About 12 tons of asbestos was received and disposed of properly during the observation period.

Total Other waste received during the observation period was 26 tons. The materials within the Other waste stream were estimated as they were unloaded. These estimated materials are listed below.

## The Other Waste Component

| Bulky   | Asbesto |
|---------|---------|
| 54%     | 46%     |
| 14 tons | 12 tons |

# LAMAR LANDFILL

# 168,591 TONS IN 1998

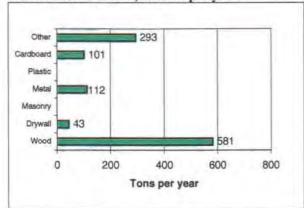
| MATERIAL                 | Tons received during | Percent of each   | Estimated   |             |
|--------------------------|----------------------|-------------------|-------------|-------------|
|                          | observation period   | material received | received in | observation |
| MSW Component            |                      | 07.00/            |             |             |
| Paper                    | 746 Tons             | 27.0%             | 45,467      |             |
| Glass                    | 104 Tons             | 3.8%              | 6,339       |             |
| Metals                   | 151 Tons             | 5.5%              | 9,203       |             |
| Plastics                 | 329 Tons             | 11.9%             | 20,052      |             |
| Organics                 | 701 Tons             | 25.3%             | 42,725      |             |
| Inorganics               | 91 Tons              | 3.3%              | 5,565       |             |
| TOTAL MSW                | 2122 Tons            | 76.7%             | 129,351     | Ions        |
| Construction Waste       |                      |                   | 31 av a     |             |
| Wood                     | 10 Tons              | 0.3%              | 581         |             |
| Dry Wall                 | 1 Tons               | 0.0%              | 43          | Tons        |
| Masonry                  | 0 Tons               | 0.0%              |             | Tons        |
| Metal                    | 2 Tons               | 0.1%              | 112         | Tons        |
| Plastic                  | 0 Tons               | 0.0%              |             | Tons        |
| Cardboard                | 2 Tons               | 0.1%              |             | Tons        |
| Other                    | 5 Tons               | 0.2%              |             | Tons        |
| TOTAL CONSTRUCTION       | 19 Tons              | 0.7%              | 1,129       | Tons        |
| Demolition Waste         |                      |                   |             |             |
| Wood                     | 46 Tons              | 1.7%              | 2,798       |             |
| Dry Wall                 | 4 Tons               | 0.1%              |             | Tons        |
| Roofing                  | 101 Tons             | 3.7%              | 6,156       |             |
| Masonry                  | 5 Tons               | 0.2%              |             | Tons        |
| Metal                    | 7 Tons               | 0.2%              |             | Tons        |
| Carpet                   | 15 Tons              | 0.5%              |             | Tons        |
| Other                    | 11 Tons              | 0.4%              |             | Tons        |
| TOTAL DEMOLITION         | 187 Tons             | 6.8%              | 11,403      | Tons        |
| Industrial Waste         |                      |                   |             |             |
| Cardboard                | 62 Tons              | 2.3%              | 3,797       | Tons        |
| Paper                    | 10 Tons              | 0.4%              | 616         | Tons        |
| Food                     | 0 Tons               | 0.0%              | -           | Tons        |
| Metal                    | 18 Tons              | 0.6%              | 1,085       | Tons        |
| Wood                     | 20 Tons              | 0.7%              | 1,207       | Tons        |
| Plastic                  | 19 Tons              | 0.7%              | 1,128       | Tons        |
| Textiles                 | 22 Tons              | 0.8%              | 1,359       | Tons        |
| Rubber                   | 9 Tons               | 0.3%              | 524         | Tons        |
| Other                    | 253 Tons             | 9.2%              | 15,432      | Tons        |
| TOTAL INDUSTRIAL         | 413 Tons             | 14.9%             | 25,147      | Tons        |
| Other Waste              |                      |                   |             |             |
| Bulky Items              | 14 Tons              | 0.5%              | 823         | Tons        |
| Soil and Inert Materials | 0 Tons               | 0.0%              | -           | Tons        |
| Asbestos                 | 12 Tons              | 0.4%              | 737         | Tons        |
| Other                    | 0 Tons               | 0.0%              | -           | Tons        |
| TOTAL OTHER WASTE        | 26 Tons              | 0.9%              | 1,560       | Tons        |
| TOTAL WASTE STREAM       | 2766 Tons            | 100%              | 168,591     | Tons        |
| TOTAL WASTE STREAM       | 2700 10115           |                   |             |             |

#### The Lamar Landfill

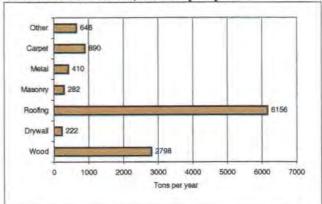
Total Waste Component - 168,591 tons per year



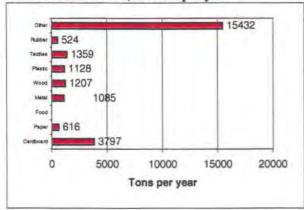
Construction Waste -1,129 tons per year



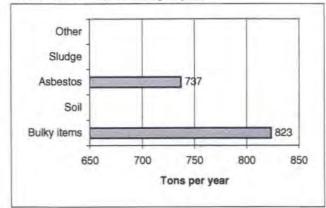
Demolition Waste -11,403 tons per year



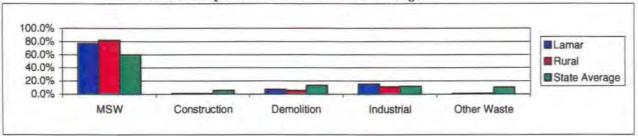
Industrial Waste - 25,147 tons per year



Other Waste - 1,560 tons per year



Lamar Waste Components vs Rural and State Averages



# Lemons Landfill

The Lemons Landfill is located in Stoddard County, MO., approximately 3 miles north of Dexter. It is owned and operated by Allied Waste Industries Inc. The disposal facility covers 75 acres and is permitted to accept all municipal solid waste (MSW) and some Other wastes such as contaminated soils and waste water treatment sludge and paper waste dust.

The Lemons Landfill accepted 157,594 tons in 1996, 182,885 tons in 1997 196,092 tons in 1998. The landfill operation was observed from Monday January 25<sup>th</sup> through Friday January 29<sup>th</sup>, 1999. The weather was fair but cold the entire week. Observation took place from 7 AM till 4:00 PM on the above dates. During the observation period, 257 trucks, delivered 3,000 tons of waste to the landfill. All loads were observed and recorded. The landfill staff felt the material received during the observation period was typical of material received year round.

Most drivers were asked where the loads originated. This was done to determine in what classification (MSW, construction, demolition, industrial, or other) the load should be recorded. However, most loads could be classified visually, without any driver data.

The Lemons Landfill accepts waste from three transfer stations. The Pemiscot County transfer station near Hayti, MO., the Jackson transfer station in Jackson MO., and the City of Cape Girardeau transfer station in Cape Girardeau, MO. These three sources represented 36% (93 trailers and roll-offs) of the traffic and 59% of the total waste. There were some demolition materials observed and recorded in these transfer loads but the overwhelming majority of the transfer station waste was MSW.

## The Total Waste Stream - 3,000 tons

The total waste stream was predominately Municipal Solid Waste (MSW). The source of the MSW portion is primarily residential, institutional, and light commercial waste. The MSW was delivered to the landfill in transfer trailers and local packer trucks. Total waste received during the observation period was 3,000 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

#### **Waste Stream Components**

| MSW       | Const.  | Demo     | Industrial | Other   |
|-----------|---------|----------|------------|---------|
| 71.1%     | 0.4%    | 7.3%     | 20.8%      | 0.5%    |
| 2132 tons | 11 tons | 220 tons | 623 tons   | 15 tons |

## Municipal Solid Waste - 2,132 tons

Municipal Solid Waste (MSW) accounted for 71% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally

contained within plastic bags. However, MSW was sorted and recorded at 19 landfills and transfer stations as part of this study in 1996 and 97. During the 56 sorts 632 samples, weighing an average of 222 pounds each, were examined. Each of these samples were hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and volume. Further details are available in the Missouri Waste Composition Study: Municipal Solid Waste.

The total MSW received during the observation period was 2132 tons. The average percentage of each major material category found in the 1996-97 waste sorts was applied to the tonnage received during the observation period and is displayed below.

Municipal Solid Waste Components

| Paper    | Glass    | Metals   | Plastics | Organics | Inorganics |
|----------|----------|----------|----------|----------|------------|
| 37.3%    | 5.8%     | 6.9%     | 14.4%    | 30.8%    | 4.8%       |
| 795 tons | 124 tons | 147 tons | 307 tons | 657 tons | 102 tons   |

#### Construction Waste - 11 tons

Only about 0.4% of the total waste received was from new construction sources. Construction waste loads were transported to the landfill in open top roll-off containers, dump trucks, or open trailers. The area served by the landfill is not a fast growing area and open burning is permitted in most municipalities and all counties. Both of these factors may have contributed to the low amount of construction waste. The construction loads tended to be lighter, less weathered, and more homogeneous (all wood and dry wall).

Total construction waste received during the observation period was 10.9 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

Wood Dry Wall Masonry Metal Plas. Cardboard Other

60% 40% 0% 0% 0% 0% 0% 6.5tons 4.4 tons 0 tons 0 tons 0 tons 0 tons

### Demolition Waste - 220 tons

About 7.3% of the total waste was from demolition sources. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Roofing waste was typically delivered to the landfill by independent contractors and was not mixed with other materials. The remaining demolition loads contained more mixed materials. The wood was more weathered, there was very little if any cardboard, and there was more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste as compared to the construction waste.

Total demolition waste received during the observation period was 220 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed below.

| The   | Demo     | lition  | W   | aste   | Com   | ponent   |
|-------|----------|---------|-----|--------|-------|----------|
| A ALL | TO CHARM | THUNDAL | 7.7 | een ee | COLLE | JULLELLE |

| Wood    | Dry Wall | Roof    | Masonry | Metal  | Carpet  | Other  |
|---------|----------|---------|---------|--------|---------|--------|
| 40%     | 8%       | 28%     | 17%     | 2%     | 5%      | 0%     |
| 88 tons | 17 tons  | 62 tons | 36 tons | 5 tons | 11 tons | 1 tons |

#### **Industrial Waste - 623 tons**

Industrial waste loads were usually transported to the landfill in open top roll-off containers or compactor units. They were normally homogeneous, containing a single waste products from a manufacturing process. There were two main industrial generators. Proctor and Gamble had 134 tons (21.5% of the industrial component), mostly disposable diaper scraps, and Norranda Aluminum delivered 200 tons (32% of the industrial component) of aluminum ore dust from their smelting process. The paper materials were primarily from Proctor and Gamble, the food materials were from Tyson (dead birds), wood materials were mostly sawdust and small pieces of particle board, plastic materials were from Proctor and Gamble, and the materials in the "other" category listed below were primarily aluminum dest and a sludge product from a plastics manufacturer.

Total industrial waste received during the observation period was 623 tons. The materials within the industrial waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Industrial Waste Component

| Cardbrd | Paper    | Food    | Metal  | Wood    | Plas.   | Tex.    | Rbr.    | Other    |
|---------|----------|---------|--------|---------|---------|---------|---------|----------|
| 6%      | 17%      | 4%      | 0%     | 11%     | 12%     | 4%      | 3%      | 42%      |
| 38 tons | 109 tons | 27 tons | 2 tons | 71 tons | 73 tons | 22 tons | 18 tons | 263 tons |

#### Other Waste - 15 tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items include furniture, mattresses, appliances, etc. Most of these bulky items were received from the transfer stations and estimated as a percent of those loads.

Total Other waste received during the observation period was 15 tons. The materials within the Other waste stream were estimated as they were unloaded. These estimated materials are listed below.

### The Other Waste Component

Bulky Items 100% 15 tons

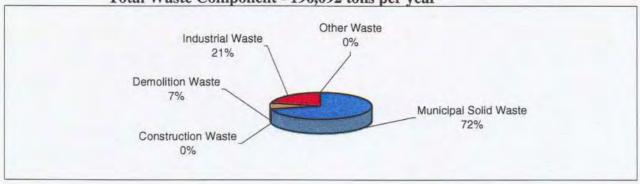
# LEMONS LANDFILL

# 196,092 TONS IN 1998

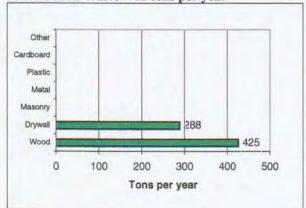
| MATERIAL                 | Tons received during | Percent of each   | Estimated ton   | nage    |
|--------------------------|----------------------|-------------------|-----------------|---------|
|                          | observation period   | material received | received in 199 | 98      |
| MSW Component            |                      |                   | based on obse   | rvation |
| Paper                    | 795 Tons             | 26.5%             | 51,961          | Tons    |
| Glass                    | 124 Tons             | 4.1%              | 8,105           | Tons    |
| Metals                   | 147 Tons             | 4.9%              | 9,608           | Tons    |
| Plastics                 | 307 Tons             | 10.2%             | 20,065          | Tons    |
| Organics                 | 657 Tons             | 21.9%             | 42,941          | Tons    |
| Inorganics               | 102 Tons             | 3.4%              | 6,667           | Tons    |
| TOTAL MSW                | 2132 Tons            | 71.1%             | 139,347         | Tons    |
| Construction Waste       |                      |                   |                 |         |
| Wood                     | 7 Tons               | 0.2%              |                 | Tons    |
| Dry Wall                 | 4 Tons               | 0.1%              | 288             | Tons    |
| Masonry                  | 0 Tons               | 0.0%              |                 | Tons    |
| Metal                    | 0 Tons               | 0.0%              | 3               | Tons    |
| Plastic                  | 0 Tons               | 0.0%              | 7               | Tons    |
| Cardboard                | 0 Tons               | 0.0%              | -               | Tons    |
| Other                    | 0 Tons               | 0.0%              | 4               | Tons    |
| TOTAL CONSTRUCTION       |                      | 0.4%              | 712             | Tons    |
| Demolition Waste         |                      |                   |                 |         |
| Wood                     | 88 Tons              | 2.9%              |                 | Tons    |
| Dry Wall                 | 17 Tons              | 0.6%              |                 | Tons    |
| Roofing                  | 62 Tons              | 2.1%              |                 | Tons    |
| Masonry                  | 36 Tons              | 1.2%              | 2,353           | Tons    |
| Metal                    | 5 Tons               | 0.1%              |                 | Tons    |
| Carpet                   | 11 Tons              | 0.4%              |                 | Tons    |
| Other                    | 1 Tons               | 0.0%              |                 | Tons    |
| TOTAL DEMOLITION         | 220 Tons             | 7.3%              | 14,346          | Tons    |
| Industrial Waste         |                      |                   | 200             |         |
| Cardboard                | 37 Tons              | 1.2%              |                 | Tons    |
| Paper                    | 109 Tons             | 3.6%              |                 | Tons    |
| Food                     | 27 Tons              | 0.9%              |                 | Tons    |
| Metal                    | 2 Tons               | 0.1%              |                 | Tons    |
| Wood                     | 71 Tons              | 2.4%              | 4,641           |         |
| Plastic                  | 73 Tons              | 2.4%              | 4,771           |         |
| Textiles                 | 22 Tons              | 0.7%              |                 | Tons    |
| Rubber                   | 18 Tons              | 0.6%              |                 | Tons    |
| Other                    | 264 Tons             | 8.8%              | 17,255          |         |
| TOTAL INDUSTRIAL         | 623 Tons             | 20.8%             | 40,719          | Tons    |
| Other Waste              |                      |                   | 200             | -       |
| Bulky Items              | 15 Tons              | 0.5%              | 967             | Tons    |
| Soil and Inert Materials | Tons                 | 0.0%              | 197             | Tons    |
| Asbestos                 | Tons                 | 0.0%              |                 | Tons    |
| Other                    | Tons                 | 0.0%              |                 | Tons    |
| TOTAL OTHER WASTE        | 15 Tons              | 0.5%              | 967             | Tons    |
| TOTAL WASTE STREAM       | 3000 Tons            | 100%              | 196,092         | Tons    |

#### The Lemons Landfill

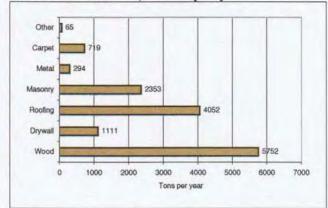
Total Waste Component - 196,092 tons per year



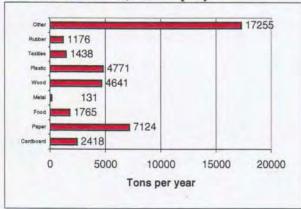
Construction Waste -712 tons per year



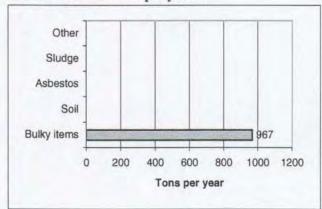
Demolition Waste -14,346 tons per year



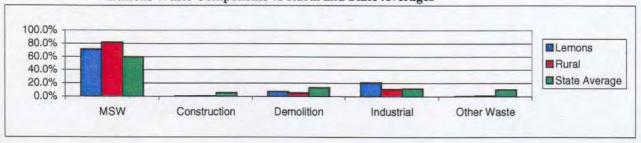
Industrial Waste - 40,719 tons per year



Other Waste - 967 tons per year



Lemons Waste Components vs Rural and State Averages



# Maple Hill Landfill

The Maple Hill Landfill is located in Macon County, approximately 5 miles west of Macon, MO. It is owned and operated by Superior Waste Services Inc. The disposal facility is permitted to accept all municipal solid waste (MSW) and some Other wastes such as asbestos, contaminated soils and waste water treatment sludge.

The Maple Hill Landfill accepted 48,274 tons in 1996, 60,331 tons in 1997 and 114,982 tons in 1998. The landfill operation was observed from Monday April 26<sup>th</sup> through Thursday April 29<sup>th</sup>, 1999. The weather was cool and rainy for the first three days and was fair on Thursday. Observation took place from 7 AM till 4:30 PM on the above dates. The composition of the waste was predictable and therefore the observation period was shortened from five days down to four days. During the four-day observation period 221 trucks, delivered 1,757 tons of waste to the landfill. The landfill staff felt the material received during the observation period was typical of material received year round. They occasionally receive small quantities of asbestos and contaminated soil but those quantities are statistically nil and during sunnier weather there is usually more construction and demolition waste.

All loads could be classified visually, Drivers were asked about the generation point for industrial loads in order to better estimate material types.

## The Total Waste Stream - 1,757 tons

The total waste stream was primarily Municipal Solid Waste (MSW). The source of the MSW portion is primarily residential, institutional, and light commercial waste. The MSW was delivered to the landfill in trailers from company owned transfer stations and local packer trucks. Total waste received during the observation period was 1,757 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

#### **Waste Stream Components**

| MSW       | Const.  | Demo     | <b>Industrial</b> | Other   |
|-----------|---------|----------|-------------------|---------|
| 77.8%     | 0.8%    | 8.3%     | 10.8%             | 2.3%    |
| 1367 tons | 14 tons | 146 tons | 189 tons          | 41 tons |

## **Municipal Solid Waste - 1,367 Tons**

Municipal Solid Waste (MSW) accounted for 78% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally contained within plastic bags. However, MSW was sorted and recorded at 19 landfills and transfer stations as part of this study in 1996 and 97. The Maple Hill Landfill was one of those 19 sites. During the two waste sorts at this facility, 24 samples weighing an average of 241

pounds each were hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and volume. Further details are available in the *Missouri Waste Composition Study: Municipal Solid Waste*.

The total MSW received during the observation period was 1,367 tons. The average percentage of each major material category found in the 1996-97 waste sorts at Maple Hill was applied to the tonnage received during the observation period and is displayed below.

#### **Municipal Solid Waste Components**

| Paper    | Glass   | Metals  | Plastics | Organics | Inorganics |
|----------|---------|---------|----------|----------|------------|
| 37.3%    | 5.2%    | 6.9%    | 15.1%    | 32.4%    | 3.1%       |
| 511 tons | 71 tons | 94 tons | 206 tons | 443 tons | 42 tons    |

#### **Construction Waste - 14 Tons**

Only about 0.8% of the total waste received was from new construction sources. Construction waste loads are typically transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Only five roll-off trucks delivered construction waste during the observation period and they were all relatively light loads.

Total construction waste received during the observation period was 14 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

| Construction Waste Components |          |         |       |        |         |       |  |  |
|-------------------------------|----------|---------|-------|--------|---------|-------|--|--|
| Wood                          | Dry Wall | Masonry | Metal | Plas.  | Cardbrd | Other |  |  |
| 44%                           | 15%      | 10%     | 6%    | 13%    | 8%      | 5%    |  |  |
| 6 tons                        | 2 tons   | 1 ton   | 1 ton | 2 tons | 1 ton   | 1 ton |  |  |

#### **Demolition Waste - 146 Tons**

About 8% of the total waste was from demolition sources. Demolition waste loads are usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Four roofing waste loads were delivered to the landfill by independent contractors and was not mixed with other materials. The remaining demolition loads contained more mixed materials. The other category was primarily wet insulation from the local power plant.

Total demolition waste received during the observation period was 146 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed below.

| The Demolition | Waste | Component |
|----------------|-------|-----------|
|----------------|-------|-----------|

| Wood    | Dry Wall | Roof    | Masonry | Metal | Carpet | Other   |
|---------|----------|---------|---------|-------|--------|---------|
| 51%     | 11%      | 18%     | 3%      | 6%    | 4%     | 7%      |
| 75 tons | 16 tons  | 27 tons | 4 tons  | 8 ton | 6 tons | 10 tons |

### **Industrial Waste - 189 Tons**

About 11% of the total waste was from industrial sources. Food and plastic wastes were significant. Food came from a processing plant in Tenton and the Con Agra plant in Macon. Plastics came from several small manufacturers in the area. Rubber was in the form of a fluffy type material and came from the tire processor in Macon. The "other" material was primarily a sludge type of material generated by a wire manufacturer.

Total industrial waste received during the observation period was 189 tons. The materials within the industrial waste component were estimated as they were unloaded. These estimated materials are listed below.

The Industrial Waste Component

| Cardbrd | Paper  | Food    | Metal   | Wood    | Plas.   | Tex.   | Rbr.    | Other   |
|---------|--------|---------|---------|---------|---------|--------|---------|---------|
| 9%      | 2%     | 27%     | 5%      | 7%      | 27%     | 4%     | 10%     | 10%     |
| 16 tons | 4 tons | 50 tons | 10 tons | 13 tons | 51 tons | 7 tons | 19 tons | 19 tons |

#### Other Waste - 41 Tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items accounted for a little over half of the other waste. Bulky items include furniture, mattresses, appliances, bicycles, etc. Most of these bulky items were received in transfer trailers. Organic matter (hay and manure) from a local meat processing plant accounted for the rest.

Total other waste received during the observation period was 41 tons. The materials within the other waste stream were estimated as they were unloaded. These estimated materials are listed below.

### The Other Waste Component

| <b>Bulky Items</b> | Organic Material |  |  |  |  |
|--------------------|------------------|--|--|--|--|
| 52%                | 48%              |  |  |  |  |
| 21 tons            | 20 tons          |  |  |  |  |

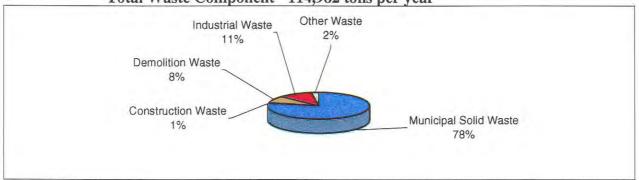
# MAPLE HILL LANDFILL

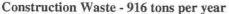
# 114,982 TONS IN 1998

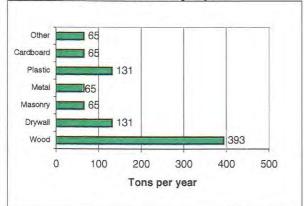
| MATERIAL                 | Tons received during observation period | Percent of each material received | Estimated tonnage received in 1998 |
|--------------------------|---|-----------------------------------|------------------------------------|
| MSW Component            |   |                                   | based on observation               |
| Paper                    | 511 Tons                                | 29.1%                             | 33,441 Tons                        |
| Glass                    | 71 Tons                                 | 4.0%                              | 4,646 Tons                         |
| Metals                   | 94 Tons                                 | 5.4%                              | 6,152 Tons                         |
| Plastics                 | 206 Tons                                | 11.7%                             | 13,481 Tons                        |
| Organics                 | 443 Tons                                | 25.2%                             | 28,991 Tons                        |
| Inorganics               | 42 Tons                                 | 2.4%                              | 2,749 Tons                         |
| TOTAL MSW                | 1367 Tons                               | 77.8%                             | 89,460 Tons                        |
| Construction Waste       |   |                                   |                                    |
| Wood                     | 6 Tons                                  | 0.3%                              | 393 Tons                           |
| Dry Wall                 | 2 Tons                                  | 0.1%                              | 131 Tons                           |
| Masonry                  | 1 Tons                                  | 0.1%                              | 65 Tons                            |
| Metal                    | 1 Tons                                  | 0.1%                              | 65 Tons                            |
| Plastic                  | 2 Tons                                  | 0.1%                              | 131 Tons                           |
| Cardboard                | 1 Tons                                  | 0.1%                              | 65 Tons                            |
| Other                    | 1 Tons                                  | 0.1%                              | 65 Tons                            |
| TOTAL CONSTRUCTION       | 14 Tons                                 | 0.8%                              | 916 Tons                           |
| Demolition Waste         |   |                                   |                                    |
| Wood                     | 75 Tons                                 | 4.3%                              | 4,908 Tons                         |
| Dry Wall                 | 16 Tons                                 | 0.9%                              | 1,047 Tons                         |
| Roofing                  | 27 Tons                                 | 1.5%                              | 1,767 Tons                         |
| Masonry                  | 4 Tons                                  | 0.2%                              | 262 Tons                           |
| Metal                    | 8 Tons                                  | 0.5%                              | 524 Tons                           |
| Carpet                   | 6 Tons                                  | 0.3%                              | 393 Tons                           |
| Other                    | 10 Tons                                 | 0.6%                              | 654 Tons                           |
| TOTAL DEMOLITION         | 146 Tons                                | 8.3%                              | 9,555 Tons                         |
| Industrial Waste         |   |                                   |                                    |
| Cardboard                | 16 Tons                                 | 0.9%                              | 1,047 Tons                         |
| Paper                    | 4 Tons                                  | 0.2%                              | 262 Tons                           |
| Food                     | 50 Tons                                 | 2.8%                              | 3,272 Tons                         |
| Metal                    | 10 Tons                                 | 0.6%                              | -654 Tons                          |
| Wood                     | 13 Tons                                 | 0.7%                              | 851 Tons                           |
| Plastic                  | 51 Tons                                 | 2.9%                              | 3,338 Tons                         |
| Textiles                 | 7 Tons                                  | 0.4%                              | 458 Tons                           |
| Rubber                   | 19 Tons                                 | 1.1%                              | 1,243 Tons                         |
| Other                    | 19 Tons                                 | 1.1%                              | 1,243 Tons                         |
| TOTAL INDUSTRIAL         | 189 Tons                                | 10.8%                             | 12,369 Tons                        |
| Other Wastes             |   | 4                                 |                                    |
| Bulky Items              | 21 Tons                                 | 1.2%                              | 1,374 Tons                         |
| Soil and Inert Materials | 0 Tons                                  | 0.0%                              | - Tons                             |
| Asbestos                 | 0 Tons                                  | 0.0%                              | - Tons                             |
| Organic material         | 20 Tons                                 | 1.1%                              | 1,309 Tons                         |
| TOTAL OTHER WASTE        | 41 Tons                                 | 2.3%                              | 2,683 Tons                         |
| TOTAL WASTE STREAM       | 1757 Tons                               | 100%                              | 114,982 Tons                       |

## The Maple Hill Landfill

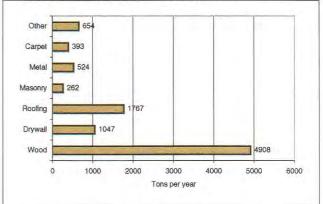
Total Waste Component - 114,982 tons per year



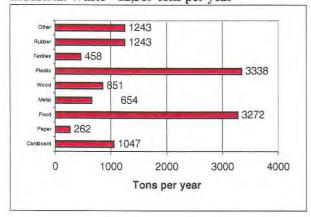




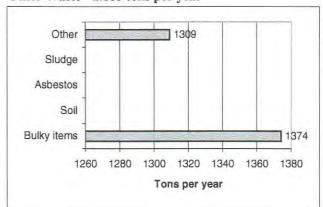
#### Demolition Waste - 9,555 tons per year



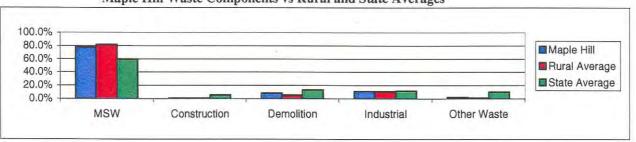
Industrial Waste - 12,369 tons per year



Other Waste - 2.683 tons per year



Maple Hill Waste Components vs Rural and State Averages



# Oak Ridge Landfill

The Oak Ridge Landfill Inc. is located in West St. Louis County, MO., approximately 25 miles west of St. Louis, MO. It is owned and operated by Superior Waste Services Inc. An upscale residential community now surrounds the landfill, which originally was in a very sparsely populated portion of St. Louis County. The disposal facility is permitted to accept all municipal solid waste (MSW) and some other wastes such as contaminated soils, asbestos, and wastewater treatment sludge.

The Oak Ridge Landfill accepted 179,686 tons in 1996, 193,403 tons in 1997 and 262,365 tons in 1998. The landfill operation was observed from Monday November 16<sup>h</sup> through Friday November 20<sup>th</sup>. The weather was sunny and fair during the entire week. Observation took place from 7 AM till 4:30 PM on the above dates. During the observation period, 720 trucks, delivered 6172 tons of waste to the landfill. All loads were observed and recorded. The landfill staff felt the material received during the observation period was typical of material received year round.

Because the traffic was high, each driver was not asked where the load originated. This would have been helpful to determine where the load originated and how it should be recorded. Nevertheless, all loads could be classified visually, without any driver data.

The Superior Oak Hill Landfill accepts waste from St. Louis, St. Charles, and Jefferson counties. The nearest Missouri sanitary landfills are the Fred Weber Landfill and the Bridgeton Landfill, both in St. Louis County. The Peerless Construction and Demolition Landfill is within 5 miles. There were very few self-hauls. Most traffic was commercial. The City of St. Peters Transfer Station delivered their waste to the landfill.

### The Total Waste Stream - 6152 tons

The total waste stream was predominantly Municipal Solid Waste (MSW). The source of the MSW was primarily residential, institutional, and light commercial waste. The amount of construction and demolition waste was almost identical. This is in contrast with many of the other landfills that receive two to five times more demolition than construction waste. The area around the landfill is growing rapidly and most construction is new rather than renovation or demolition. The industrial component was relatively low due to the lack of industrial activity in the West St. Louis County area. Other waste (contaminated soil) was surprisingly high. Total waste received during the observation period was 6152 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

Wasta Ctusam Commonante

| MSW       | Const.   | Demo     | Industrial | Other     |
|-----------|----------|----------|------------|-----------|
| 55%       | 6%       | 6%       | 8%         | 25%       |
| 3381 tons | 358 tons | 365 tons | 515 tons   | 1533 tons |

## Municipal Solid Waste – 3381 Tons

Municipal Solid Waste (MSW) accounted for only 25% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally contained within plastic bags. However, MSW was sorted and recorded at 19 landfills and transfer stations as part of this study in 1996 and 97. During the 56 sorts 632 samples, weighing an average of 222 pounds each, were examined. Each of these samples were hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and volume. Further details are available in the Missouri Waste Composition Study: Municipal Solid Waste.

The total MSW received during the observation period was 3381 tons. The average percentage of each major material category found in the 1996-97 waste sorts was applied to the tonnage received during the observation period and is displayed below.

Municipal Solid Waste Components

| Paper      | Glass    | Metals   | Plastics | Organics   | Inorganics |
|------------|----------|----------|----------|------------|------------|
| 37.3%      | 5.8%     | 6.9%     | 14.4%    | 30.8%      | 4.8%       |
| 1,261 tons | 196 tons | 233 tons | 487 tons | 1,042 tons | 162 tons   |

#### **Construction Waste - 358 tons**

About 6% of the total waste received was from new construction sources. Construction waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. The construction loads tended to be lighter, less weathered, more homogeneous (all wood, dry wall, etc), and contained more cardboard boxes (usually from fixtures) than the demolition waste loads.

Total construction waste received during the observation period was 368 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

| Construction Waste Components |          |          |        |        |         |         |  |  |
|-------------------------------|----------|----------|--------|--------|---------|---------|--|--|
| Wood                          | Dry Wall | Masonry  | Metal  | Plas.  | Cardbrd | Other   |  |  |
| 36%                           | 22%      | 31%      | 1%     | 2%     | 4%      | 4%      |  |  |
| 131 tons                      | 80 tons  | 109 tons | 3 tons | 9 tons | 13 tons | 14 tons |  |  |

### **Demolition Waste - 365 tons**

About 6% of the total waste was from demolition sources. According to drivers, much of the heavier demolition waste such as roofing shingles are taken to the Peerless C&D landfill where the tipping fee is less and the loads are charged by volume instead of weight. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. The wood was more weathered, there was very little if any cardboard, and there was

more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste as compared to the construction waste.

Total demolition waste received during the observation period was 365 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed below.

#### The Demolition Waste Component

| Wood     | Dry Wall | Roof    | Masonry  | Metal   | Carpet  | Other   |
|----------|----------|---------|----------|---------|---------|---------|
| 36%      | 2%       | 10%     | 36%      | 5%      | 6%      | 4%      |
| 132 tons | 8 tons   | 38 tons | 132 tons | 19 tons | 23 tons | 13 tons |

#### **Industrial Waste - 515 tons**

About 8% of the total waste stream was from industrial sources. Industrial waste loads were usually transported to the landfill in open top roll-off containers or compactor units. They were normally homogeneous, containing a single waste products from a manufacturing process. These loads came from a variety of sources. The other material was foundry sand.

Total industrial waste received during the observation period was 515 tons. The materials within the industrial waste stream were estimated as they were unloaded. These estimated materials are listed below.

#### The Industrial Waste Component

| Cardbrd | Paper   | Food    | Metal  | Wood    | Plas.   | Tex.   | Rbr.   | Other    |
|---------|---------|---------|--------|---------|---------|--------|--------|----------|
| 17%     | 15%     | 6%      | 1%     | 8%      | 14%     | 0%     | 1%     | 39%      |
| 88 tons | 75 tons | 33 tons | 6 tons | 41 tons | 70 tons | 0 tons | 4 tons | 199 tons |

## Other Waste - 1533 tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items include furniture, mattresses, appliances, etc.. Most of the other waste was contaminated soil. The contaminated soil came from several remediation projects in St. Louis and Washington Counties. Both the Contaminated soil and the foundry sand was unloaded next to the landfill face and used for daily cover. No asbestos was received at the landfill during the observation period.

Total other waste received during the observation period was 571 tons. The materials within the other waste stream were estimated as they were unloaded. These estimated materials are listed below.

#### The Other Waste Component

| Bulky   | Contaminated Soil |
|---------|-------------------|
| 2%      | 88%               |
| 31 tons | 1502 tons         |

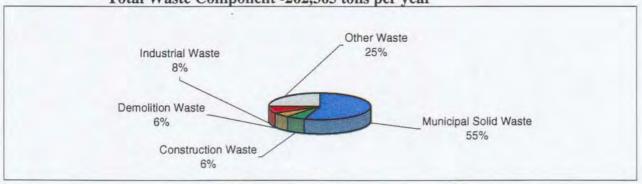
# OAK RIDGE LANDFILL

# 262,365 TONS IN 1998

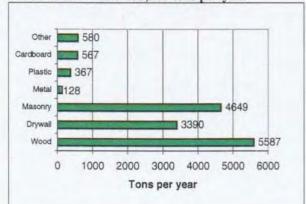
| MATERIAL                 | Tons received during | Percent of each   | Estimated   |        |
|--------------------------|----------------------|-------------------|-------------|--------|
|                          | observation period   | material received | received in |        |
| MSW Component            |                      |                   | based on o  |        |
| Paper                    | 1261 Tons            | 20.5%             | 53,778      |        |
| Glass                    | 196 Tons             | 3.2%              | 8,359       |        |
| Metals                   | 233 Tons             | 3.8%              | 9,937       |        |
| Plastics                 | 487 Tons             | 7.9%              | 20,769      |        |
| Organics                 | 1042 Tons            | 16.9%             | 44,438      |        |
| Inorganics               | 162 Tons             | 2.6%              | 6,909       |        |
| TOTAL MSW                | 3381 Tons            | 55.0%             | 144,190     | Tons   |
| Construction Waste       |                      | 7.57              |             | 4      |
| Wood                     | 131 Tons             | 2.1%              | 5,587       |        |
| Dry Wall                 | 80 Tons              | 1.3%              | 3,390       |        |
| Masonry                  | 109 Tons             | 1.8%              | 4,649       |        |
| Metal                    | 3 Tons               | 0.0%              |             | Tons   |
| Plastic                  | 9 Tons               | 0.1%              |             | Tons   |
| Cardboard                | 13 Tons              | 0.2%              |             | Tons   |
| Other                    | 14 Tons              | 0.2%              |             | Tons   |
| TOTAL CONSTRUCTION       | 358 Tons             | 5.8%              | 15,268      | Tons   |
| Demolition Waste         |                      |                   |             | -      |
| Wood                     | 132 Tons             | 2.1%              | 5,629       |        |
| Dry Wall                 | 8 Tons               | 0.1%              |             | Tons   |
| Roofing                  | 38 Tons              | 0.6%              | 1,608       |        |
| Masonry                  | 132 Tons             | 2.1%              | 5,629       |        |
| Metal                    | 19 Tons              | 0.3%              |             | Tons   |
| Carpet                   | 23 Tons              | 0.4%              |             | Tons   |
| Other                    | 13 Tons              | 0.2%              |             | Tons   |
| TOTAL DEMOLITION         | 365 Tons             | 5.9%              | 15,545      | lons   |
| Industrial Waste         | 77 54                | 3.720             | 0.704       | Se 137 |
| Cardboard                | 88 Tons              | 1.4%              | 3,761       |        |
| Paper                    | 75 Tons              | 1.2%              | 3,190       |        |
| Food                     | 33 Tons              | 0.5%              | 1,395       |        |
| Metal                    | 6 Tons               | 0.1%              |             | Tons   |
| Wood                     | 41 Tons              | 0.7%              | 1,753       |        |
| Plastic                  | 70 Tons              | 1.1%              | 2,981       |        |
| Textiles                 | 0 Tons               | 0.0%              | 450         | Tons   |
| Rubber                   | 4 Tons               | 0.1%              | 0.300       | Tons   |
| Other                    | 199 Tons             | 3.2%              | 8,487       |        |
| TOTAL INDUSTRIAL         | 515 Tons             | 8.4%              | 21,972      | Ions   |
| Other Waste              |                      | 3.5               | 4 005       | Time   |
| Bulky Items              | 31 Tons              | 0.5%              | 1,335       |        |
| Soil and Inert Materials | 1502 Tons            | 24.4%             | 64,056      |        |
| Asbestos                 | 0 Tons               | 0.0%              |             | Tons   |
| Other                    | 0 Tons               | 0.0%              | -           | Tons   |
| TOTAL OTHER WASTE        | 1533 Tons            | 24.9%             | 65,391      | Tons   |
| TOTAL WASTE STREAM       | 6152 Tons            | 100%              | 262,365     | Tons   |
|                          |                      |                   |             |        |

## The Oak Ridge Landfill

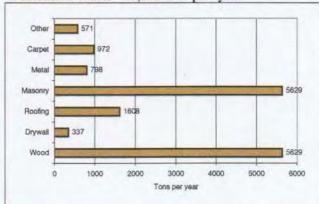
Total Waste Component -262,365 tons per year



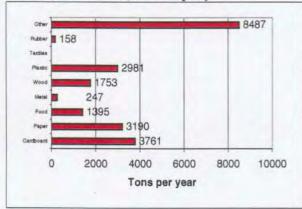
Construction Waste - 15,268 tons per year



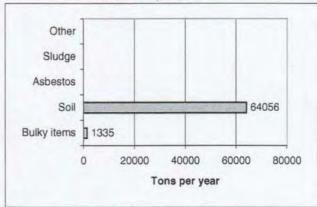
Demolition Waste - 15,545 tons per year



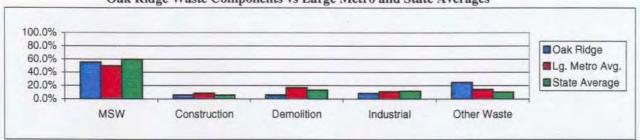
Industrial Waste - 21,972 tons per year



Other Waste -65,391 tons per year



Oak Ridge Waste Components vs Large Metro and State Averages



## Peerless C&D Landfill

The Peerless C&D Landfill is located in Peerless Park, MO., which is part of the St. Louis metropolitan area. It is owned and operated by The George and Dale Behnen. The disposal facility is permitted to accept only construction, demolition, and inert industrial materials. The landfill is situated adjacent to Interstate 44 in an industrial area.

The Peerless Landfill accepted 146,660 tons in 1996, 149,426 tons in 1997 146,249 tons in 1998. The facility does not have a scale, therefore all incoming loads are estimated by volume and converted to tonnage using a 3:1 ratio of cubic yards to the ton.

The Peerless Landfill operation was the only landfill that was observed twice. Since there are only two large C&D landfills in the state, data was needed from both seasons in order to properly project annual composition. The first observation period was on Monday September 28<sup>th</sup> 1998 through Friday October 2<sup>nd</sup> 1998. Observation took place from 7 AM till 4:30 PM on the above dates. The second observation period was on Monday March 15<sup>th</sup>, 1999 through March 19<sup>th</sup>, 1999.

During the first observation period, 423 trucks, with loads approximating 8098 cubic yards, unloaded waste. Using a 3:1 volume to weight ratio, approximately 2700 tons of waste was observed. During the second observation period 354 trucks unloaded 7965 cubic yards of waste weighing approximately 2655 tons. A Total of 777 trucks were observed delivering about 5337 tons of waste to the Peerless Landfill

Virtually all of the trucks delivered waste in open top roll-off containers or dump trucks. Nearly one half of the trucks were from Behnen Container Services (BCS). Smaller hauling companies or independent contractors operated the remainder of the trucks.

During the first observation period each driver was asked where the load originated. This was done to determine in what classification (construction, demolition, or industrial) the load should be recorded. During the second observation period most loads could be classified without any driver data.

### The Total Waste Stream - 5337 tons

The Peerless C&D Landfill is not permitted to accept Municipal Solid Waste (MSW), The construction, demolition and Industrial waste stream components were delivered to the landfill in dump trucks, roll-off containers, and small pick-ups and trailers.

Total waste received during the observation period was 5337 tons. The components of the waste stream were estimated as they were unloaded. The results of both observation periods are shown to illustrate the differences and similarities between fall and spring waste flows. These components are listed on the next page.

## Waste Stream Components - 5,337 tons (16,030 Cubic yards)

| Date         | MSW | Const. | Demo | Industrial | Other |
|--------------|-----|--------|------|------------|-------|
| 9/28 - 10/2  | 0%  | 32%    | 60%  | 8%         | 0%    |
| Cu. yds.     | 0   | 2553   | 4828 | 664        | 0     |
| Tons (3:1)   | 0   | 851    | 1609 | 221        | 0     |
| 3/15 - 3/19  | 0%  | 43%    | 53%  | 4%         | 0%    |
| Cu. yds.     | 0   | 3424   | 4239 | 302        | 0     |
| Tons (3:1)   | 0   | 1141   | 1413 | 101        | 0     |
| Average %    | 0%  | 37%    | 57%  | 6%         | 0%    |
| Total Cu. yd | s.0 | 5977   | 9067 | 966        | 0     |
| Tons (3:1)   | 0   | 1922   | 3022 | 322        | 0     |

## Construction Waste - 1,991 tons (5,973 Cubic yards)

About 37% of the total waste received was from new construction sources. Construction waste loads were transported to the landfill in open top roll-off containers, dump trucks, or open trailers.. The construction loads tended to be lighter, less weathered, and more homogeneous (all wood and dry wall). Masonry was defined as inorganic materials (bricks, concrete, etc.) which was part of a load with other materials that were classified as coming from new construction. Other materials were primarily insulation.

Total construction waste received during the observation period was 1,991 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

| Construction Waste Components |      |          |         |       |       |     |       |
|-------------------------------|------|----------|---------|-------|-------|-----|-------|
| Date                          | Wood | Dry Wall | Masonry | Metal | Plas. | OCC | Other |
| 9/28-10/2                     | 41%  | 21%      | 10%     | 1%    | 2%    | 8%  | 17%   |
| Cu. yds                       | 1033 | 538      | 266     | 22    | 58    | 212 | 424   |
| Tons (3:1)                    | 344  | 179      | 88      | 7     | 19    | 71  | 141   |
| 3/15 - 3/19                   | 41%  | 19%      | 17%     | 0%    | 5%    | 9%  | 10%   |
| Cu. yds.                      | 1374 | 640      | 582     | 12    | 158   | 315 | 344   |
| Tons (3:1)                    | 458  | 213      | 194     | 4     | 53    | 105 | 115   |
| Average %                     | 41%  | 20%      | 14%     | 1%    | 4%    | 9%  | 13%   |
| Cu. yds.                      | 2407 | 1177     | 847     | 33    | 216   | 527 | 768   |
| Tons (3:1)                    | 802  | 392      | 282     | 11    | 72    | 176 | 256   |

## Demolition Waste - 3,023 tons (9,069 Cubic yards)

About 57% of the total waste was from demolition sources. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Roofing waste was typically delivered to the landfill by independent contractors and was not mixed with other materials. The remaining demolition loads contained more mixed materials.

Total demolition waste received during the observation period was 3,023 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed below.

| The Demolition Waste Component |      |          |      |         |       |        |       |
|--------------------------------|------|----------|------|---------|-------|--------|-------|
| Date                           | Wood | Dry Wall | Roof | Masonry | Metal | Carpet | Other |
| 9/28-10/2                      | 20%  | 5%       | 34%  | 23%     | 1%    | 2%     | 15%   |
| Cu. yds.                       | 976  | 234      | 1615 | 1121    | 71    | 117    | 694   |
| Tons (3:1)                     | 325  | 78       | 538  | 374     | 24    | 39     | 231   |
| 3/15 - 3/19                    | 28%  | 7%       | 33%  | 19%     | 3%    | 3%     | 7%    |
| Cu. yds.                       | 1180 | 306      | 1383 | 814     | 124   | 146    | 287   |
| Tons (3:1)                     | 393  | 102      | 461  | 271     | 41    | 49     | 96    |
| Average                        | 24%  | 6%       | 33%  | 21%     | 2%    | 3%     | 11%   |
| Cu. yds.                       | 2156 | 540      | 2998 | 1935    | 195   | 263    | 981   |
| Tons (3:1)                     | 719  | 180      | 999  | 645     | 65    | 88     | 327   |

### Industrial Waste - 323 tons (969 Cubic yards)

About 6% of the total waste was from industrial sources. Processed tire waste from Tire Shredders Unlimited in High Ridge Missouri represented over half of the industrial waste.

Total industrial waste received during the observation period was 325 tons. The materials within the industrial waste component were estimated as they were unloaded. These estimated materials are listed below.

|             | The Industrial Waste Component |       |      |       |      |       |      |      |       |  |
|-------------|--------------------------------|-------|------|-------|------|-------|------|------|-------|--|
| Date        | Card                           | Paper | Food | Metal | Wood | Plas. | Tex. | Rbr. | Other |  |
| 9/28-10/2   | 3%                             | 7%    | 0%   | 3%    | 9%   | 16%   | 0%   | 53%  | 9%    |  |
| Cu.yds.     | 18                             | 44    | 0    | 217   | 61   | 104   | 0    | 354  | 62    |  |
| Tons (3:1)  | 5.9                            | 14.8  | 0    | 6.9   | 20.2 | 34.5  | 0    | 118  | 20.7  |  |
| 3/15 - 3/19 | 10%                            | 10%   | 0%   | 11%   | 36%  | 10%   | 0%   | 13%  | 10%   |  |
| Cu. yds.    | 29                             | 30    | 0    | 33    | 110  | 30    | 0    | 40   | 30    |  |
| Tons (3:1)  | 10                             | 10    | 0    | 11    | 37   | 10    | 0    | 13   | 10    |  |
| Average     | 5%                             | 8%    | 0%   | 6%    | 18%  | 14%   | 0%   | 41%  | 10%   |  |
| Cu. yds.    | 47                             | 74    | 0    | 54    | 171  | 134   | 0%   | 394  | 92    |  |
| Tons (3:1)  | 16                             | 25    | 0    | 18    | 57   | 45    | 0    | 131  | 31    |  |

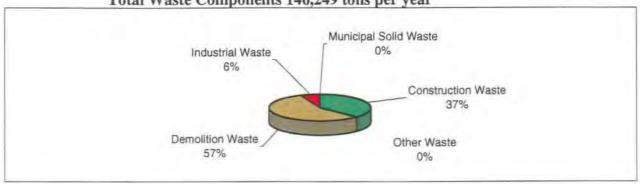
# PEERLESS LANDFILL

# 146,249 TONS IN 1998

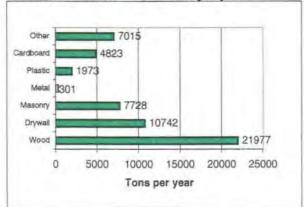
| MATERIAL                 | Tons received during observation period | Percent of each material received | Estimated tonnage received in 1998 |             |
|--------------------------|---|-----------------------------------|------------------------------------|-------------|
| MSW Component            |   |                                   | based on                           | observation |
| Paper                    | 0 Tons                                  | 0.0%                              | -                                  | Tons        |
| Glass                    | 0 Tons                                  | 0.0%                              | 1.0                                | Tons        |
| Metals                   | 0 Tons                                  | 0.0%                              | -                                  | Tons        |
| Plastics                 | 0 Tons                                  | 0.0%                              | -                                  | Tons        |
| Organics                 | 0 Tons                                  | 0.0%                              | -                                  | Tons        |
| Inorganics               | 0 Tons                                  | 0.0%                              | 2                                  | Tons        |
| TOTAL MSW                | 0 Tons                                  | 0.0%                              | -                                  | Tons        |
| Construction Waste       |   |                                   |                                    |             |
| Wood                     | 802 Tons                                | 15.0%                             | 21,977                             | Tons        |
| Dry Wall                 | 392 Tons                                | 7.3%                              | 10,742                             | Tons        |
| Masonry                  | 282 Tons                                | 5.3%                              |                                    | Tons        |
| Metal                    | 11 Tons                                 | 0.2%                              | 301                                | Tons        |
| Plastic                  | 72 Tons                                 | 1.3%                              | 1,973                              | Tons        |
| Cardboard                | 176 Tons                                | 3.3%                              | 4,823                              | Tons        |
| Other                    | 256 Tons                                | 4.8%                              | 7,015                              | Tons        |
| TOTAL CONSTRUCTION       | 1991 Tons                               | 37.3%                             | 54,559                             | Tons        |
| <b>Demolition Waste</b>  |   | 4                                 |                                    |             |
| Wood                     | 719 Tons                                | 13.5%                             | 19,703                             |             |
| Dry Wall                 | 180 Tons                                | 3.4%                              |                                    | Tons        |
| Roofing                  | 999 Tons                                | 18.7%                             | 27,375                             |             |
| Masonry                  | 645 Tons                                | 12.1%                             | 17,675                             |             |
| Metal                    | 65 Tons                                 | 1.2%                              |                                    | Tons        |
| Carpet                   | 88 Tons                                 | 1.6%                              |                                    | Tons        |
| Other                    | 327 Tons                                | 6.1%                              |                                    | Tons        |
| TOTAL DEMOLITION         | 3023 Tons                               | 56.6%                             | 82,839                             | Tons        |
| Industrial Waste         |   |                                   |                                    |             |
| Cardboard                | 16 Tons                                 | 0.3%                              |                                    | Tons        |
| Paper                    | 25 Tons                                 | 0.5%                              | 685                                | Tons        |
| Food                     | 0 Tons                                  | 0.0%                              | -                                  | Tons        |
| Metal                    | 18 Tons                                 | 0.3%                              |                                    | Tons        |
| Wood                     | 57 Tons                                 | 1.1%                              | 1,562                              |             |
| Plastic                  | 45 Tons                                 | 0.8%                              | 1,233                              |             |
| Textiles                 | 0 Tons                                  | 0.0%                              |                                    | Tons        |
| Rubber                   | 131 Tons                                | 2.5%                              | 3,590                              |             |
| Other                    | 31 Tons                                 | 0.6%                              |                                    | Tons        |
| TOTAL INDUSTRIAL         | 323 Tons                                | 6.1%                              | 8,851                              | Tons        |
| Other Waste              |   |                                   |                                    |             |
| Bulky Items              | 0 Tons                                  | 0.0%                              | -                                  | Tons        |
| Soil and Inert Materials | 0 Tons                                  | 0.0%                              | *                                  | Tons        |
| Asbestos                 | 0 Tons                                  | 0.0%                              |                                    | Tons        |
| Other                    | 0 Tons                                  | 0.0%                              |                                    | Tons        |
| TOTAL OTHER WASTE        | 0 Tons                                  | 0.0%                              |                                    | Tons        |
| TOTAL WASTE STREAM       | 5337 Tons                               | 100%                              | 146,249                            | Tons        |

## The Peerless C&D Landfill

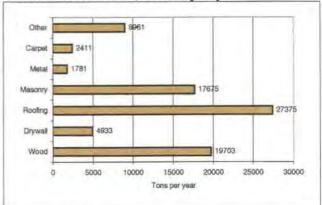
Total Waste Components 146,249 tons per year



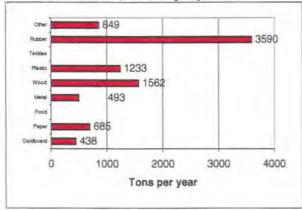




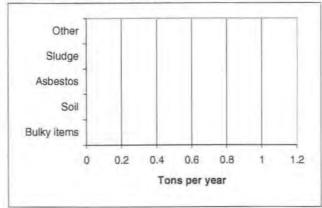
#### Demolition Waste - 82,839 tons per year



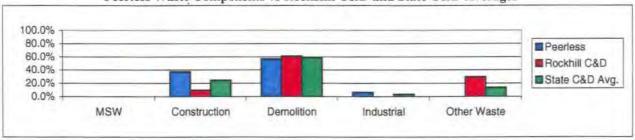
#### Industrial Waste - 8,851 tons per year



#### Other Waste - 0 tons per year



#### Peerless Waste Components vs RockHill C&D and State C&D Averages



# Rock Hill C&D Landfill

The Rock Hill C&D Landfill is located in Rock Hill, MO., which is part of the St. Louis metropolitan area. It is owned and operated by The Rock Hills Quarry Company. The disposal facility is permitted to accept only construction and demolition materials. The landfill is situated in an old quarry and surrounded by residential neighborhoods. The landfill is operated in a very efficient manner and is certainly one of the cleanest landfills in the state.

The Rock Hill C&D Landfill accepted 315,630 cubic yards (105,210 tons) in 1996, 331,938 cubic yards (110,646) tons in 1997 and 371,547 cubic yards (123,849 tons) in 1998. The landfill operation was observed from Monday February 22nd through Thursday February 25<sup>th</sup>, 1999. The weather was snowy and cold on Tuesday but fair for the remainder of the week. Observation took place from 8 AM till 4 PM on the above dates. During the four-day period 420 trucks, delivering 5,093 cubic yards of waste to the landfill were observed. The Rock Hill C&D Landfill does not have a scale and therefore all waste was estimated in cubic yards. The landfill converts the yardage to tons using a 3:1 (yards to tons) ration when reporting tonnage figures to the Missouri Department of Natural Resources. The same 3:1 ration was used to convert cubic yards to tons in this report.

The landfill staff felt the material received during the observation period was typical of material received year round. All loads could be classified visually without interviewing drivers.

# The Total Waste Stream - 1,697 tons (5,093 cubic yards)

The Rock Hill C&D Landfill is not permitted to accept Municipal Solid Waste (MSW), and by choice does not accept industrial waste. The construction, demolition and other waste stream components were delivered to the landfill in dump trucks, roll-off containers, and small pick-ups and trailers.

Total waste received during the observation period was 5,093 cubic yards (1,697 tons). The components of the waste stream were estimated as they were unloaded. These components are listed below.

Wasta Straam Components

|                 | waste stream componen | is .             |
|-----------------|-----------------------|------------------|
| Construction    | Demolition            | Other            |
| 9.5%            | 61%                   | 29.5%            |
| 482 cubic yards | 3110 cubic yards      | 1501 cubic yards |
| 161 tons        | 1036 tons             | 500 tons         |

# Construction Waste - 161 tons (482 cubic yards)

About 9.5% of the total waste received was from new construction sources. Construction waste loads were transported to the landfill in open top roll-off containers, dump trucks, or open trailers.. The construction loads tended to be lighter, less weathered, and more homogeneous (all wood and dry wall). Masonry was defined as inorganic materials (bricks, concrete, etc.) which was part of a load with other materials that were classified as coming from new construction. Other materials were primarily insulation.

Total construction waste received during the observation period was 482 cubic yards (161 tons). The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

| Construction Waste Components |          |         |        |         |           |        |  |
|-------------------------------|----------|---------|--------|---------|-----------|--------|--|
| Wood                          | Dry Wall | Masonry | Metal  | Plas.   | Cardboard | Other  |  |
| 51%                           | 24%      | 4%      | 0%     | 4%      | 12%       | 5%     |  |
| 245 yds.                      | 115 yds. | 20 yds. | 0 yds. | 18 yds. | 58 yds.   | 26     |  |
| 82 tons                       | 38 tons  | 7 tons  | 0 tons | 6 tons  | 19 tons   | 9 tons |  |

# **Demolition Waste - 1,036 tons (3,108 cubic yards)**

About 61% of the total waste was from demolition sources. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Roofing waste was typically delivered to the landfill by independent contractors and was not mixed with other materials. The remaining demolition loads contained more mixed materials. The wood was more weathered and broken up, there was very little if any cardboard, and there was more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste as compared to the construction waste.

The masonry materials were difficult to classify. Several trucks delivered dirt to the landfill during the observation period. Some of that dirt was unloaded away from the landfill face and used as daily cover. This dirt was classified as other waste and is listed in a separate area. Some trucks delivering contained dirt, asphalt, bricks, and rocks within their loads. These loads were dumped near the landfill face and mixed immediately with the other waste. The landfill personnel made the choices on where the dirt was unloaded.

Total demolition waste received during the observation period was 3,110 cubic yards (1036 tons). The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed below.

|           | The Demolition Waste Component |          |           |         |         |        |
|-----------|--------------------------------|----------|-----------|---------|---------|--------|
| Wood      | Dry Wall                       | Roof     | Masonry   | Metal   | Carpet  | Other  |
| 40%       | 2%                             | 13%      | 41%       | 3%      | 1%      | 0%     |
| 1239 yds. | 68 yds.                        | 411 yds. | 1273 yds. | 91 yds. | 22 yds. | 6 yds. |
| 413 tons  | 23 tons                        | 137 tons | 424 tons  | 30 tons | 7 tons  | 2 tons |

# Other Waste - 500 tons (1501 cubic yards)

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). The only materials which fit into this category was the clean dirt that was received and stockpiled for daily cover as explained earlier. The Rock Hill Landfill does not have an internal source for daily cover and therefore relies on clean soil received from contractors for that purpose. No contaminated soil was received.

Total Other waste received during the observation period was 1501 cubic yards (500 tons). The materials within the other waste stream were estimated, as they were unloaded. These estimated materials are listed below.

The Other Waste Component

Soil used for daily cover 1501 cubic yards 500 tons

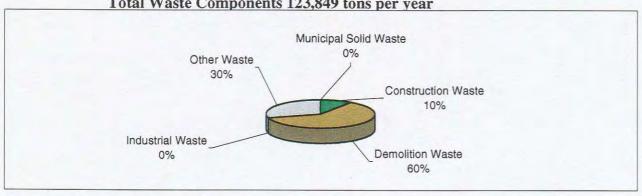
# **ROCKHILL LANDFILL**

# 123,849 TONS IN 1998

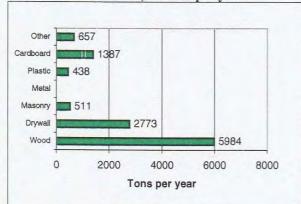
| MATERIAL                 | Tons received during | Percent of each   | Estimated tonnage    |                   |
|--------------------------|----------------------|-------------------|----------------------|-------------------|
|                          | observation period   | material received | received in 1998     |                   |
| MSW Component            |                      | 2.00/             | based on observation | <b>—</b> 2701 250 |
| Paper                    | 0                    | 0.0%              | -                    | Tons              |
| Glass                    | 0                    | 0.0%              | \$                   | Tons              |
| Metals                   | 0                    | 0.0%              | 7                    | Tons              |
| Plastics                 | 0                    | 0.0%              | 16.00 m              | Tons              |
| Organics                 | 0                    | 0.0%              | 1.8                  | Tons              |
| Inorganics               | 0                    | 0.0%              | 1.20                 | Tons              |
| TOTAL MSW                | 0                    | 0.0%              |                      | Tons              |
| Construction Waste       |                      |                   |                      |                   |
| Wood                     | 82                   | 4.8%              |                      | Tons              |
| Dry Wall                 | 38                   | 2.2%              |                      | Tons              |
| Masonry                  | 7                    | 0.4%              | 511                  | Tons              |
| Metal                    | 0                    | 0.0%              | 1,00                 | Tons              |
| Plastic                  | 6                    | 0.4%              | 438                  | Tons              |
| Cardboard                | 19                   | 1.1%              | 1,387                | Tons              |
| Other                    | 9                    | 0.5%              | 657                  | Tons              |
| TOTAL CONSTRUCTION       | 161                  | 9.5%              | 11,750               | Tons              |
| Demolition Waste         |                      |                   |                      |                   |
| Wood                     | 413                  | 24.3%             | 30,141               | Tons              |
| Dry Wall                 | 23                   | 1.4%              | 1,679                | Tons              |
| Roofing                  | 137                  | 8.1%              | 9,998                | Tons              |
| Masonry                  | 424                  | 25.0%             | 30,944               | Tons              |
| Metal                    | 30                   | 1.8%              |                      | Tons              |
| Carpet                   | 7                    | 0.4%              |                      | Tons              |
| Other                    | 2                    | 0.1%              |                      | Tons              |
| TOTAL DEMOLITION         | 1036                 | 61.0%             | 75,608               | Tons              |
| Industrial Waste         |                      |                   | 2                    |                   |
| Cardboard                | 0                    | 0.0%              | 2.0                  | Tons              |
| Paper                    | 0                    | 0.0%              |                      | Tons              |
| Food                     | 0                    | 0.0%              |                      | Tons              |
| Metal                    | 0                    | 0.0%              | 1.5                  | Tons              |
| Wood                     | 0                    | 0.0%              | -                    | Tons              |
| Plastic                  | 0                    | 0.0%              | -                    | Tons              |
| Textiles                 | 0                    | 0.0%              | -                    | Tons              |
| Rubber                   | 0                    | 0.0%              | -                    | Tons              |
| Other                    | 0                    | 0.0%              | -5                   | Tons              |
| TOTAL INDUSTRIAL         | 0                    | 0.0%              | Ť                    | Tons              |
| Other Waste              |                      |                   |                      |                   |
| Bulky Items              |                      | 0.0%              |                      | Tons              |
| Soil and inert materials | 500                  | 29.5%             | 36,491               | Tons              |
| Sludge                   |                      | 0.0%              | -                    | Tons              |
| Other                    |                      | 0.0%              | -                    | Tons              |
| TOTAL OTHER WASTE        | 500                  | 29.5%             | 36,491               | Tons              |
| TOTAL WASTE STREAM       | 1697                 | 100%              | 123,849              | Tons              |
|                          |                      |                   |                      |                   |

## The Rockhill C&D Landfill

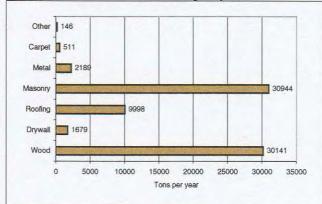
Total Waste Components 123,849 tons per year



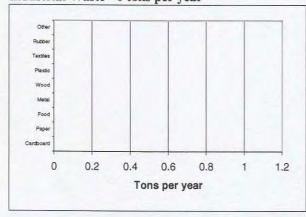
Construction Waste -11,750 tons per year



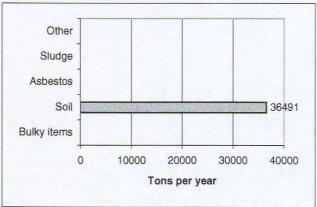
Demolition Waste - 75,608 tons per year



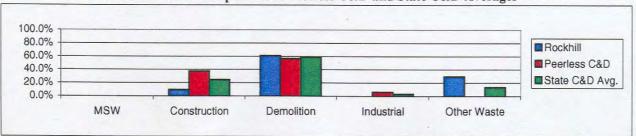
Industrial Waste - 0 tons per year



Other Waste - 36,491 tons per year



RockHill Waste Components vs Peerless C&D and State C&D Averages



# The Southeast Sanitary Landfill

The Southeast Sanitary Landfill is located in Kansas City, MO. It is owned and operated by Allied Waste Systems Inc. The disposal facility covers 126 acres and is permitted to accept all municipal solid waste (MSW) and some other wastes such as contaminated soils, asbestos, and wastewater treatment sludge.

The Southeast Landfill accepted 341,328 tons in 1996, 306,569 tons in 1997 and 348,260 tons in 1998. The landfill operation was observed from Monday November 30<sup>h</sup> through Thursday December 3rd. The weather was sunny and fair during the entire week. The Southeast Landfill is open 24 hours a day. However the observation took place from 8 AM till 4:30 PM on the above dates. During the observation period, 660 trucks, delivered 4485 tons of waste to the landfill. All loads were observed and recorded. The landfill staff felt the material received during the observation period was typical of material received year round.

Because the traffic was high, each driver was not asked where the load originated. However, all loads could be classified visually, without any driver data.

The Southeast Landfill accepts waste from mainly from Jackson and Cass counties. The nearest Missouri sanitary landfills are the Courtney Ridge Landfill and the City of Lee's Summit Landfill, both in Jackson County. The There are no construction and demolition Landfills on the Missouri side of the State line. However there is a Construction and demolition landfill in Johnson County, Kansas. There were relatively few self-hauls. Most traffic was commercial. The Cass County Transfer Station delivered their waste to the landfill.

# The Total Waste Stream - 4,482 tons

The total waste stream was mixed with a plurality being Municipal Solid Waste (MSW). The source of the MSW was primarily residential, institutional, and light commercial waste. The demolition waste was almost three times larger than the construction waste. Much of the area served by the landfill has older housing that tends to push demolition waste streams higher. The amount of industrial waste was about normal but the other waste component (contaminated soil) was surprisingly high.

Total waste received during the observation period was 4485 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

W 1 01 0

| MSW       | Const.   | Demo    | Industrial | Other     |
|-----------|----------|---------|------------|-----------|
| 45%       | 6%       | 17%     | 10%        | 22%       |
| 2019 tons | 272 tons | 741tons | 448 tons   | 1002 tons |

# Municipal Solid Waste - 2,019 tons

Municipal Solid Waste (MSW) accounted for about 45% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally contained within plastic bags. However, MSW was sorted and recorded at 19 landfills and transfer stations as part of this study in 1996 and 97. During the 56 sorts 632 samples, weighing an average of 222 pounds each, were examined. Each of these samples were hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and volume. Further details are available in the *Missouri Waste Composition Study: Municipal Solid Waste*.

The total MSW received during the observation period was 2,019tons. The average percentage of each major material category found in the 1996-97 waste sorts was applied to the tonnage received during the observation period and is displayed below.

#### **Municipal Solid Waste Components**

| Paper    | Glass    | Metals   | Plastics | Organics | Inorganics |
|----------|----------|----------|----------|----------|------------|
| 37.3%    | 5.8%     | 6.9%     | 14.4%    | 30.8%    | 4.8%       |
| 753 tons | 117 tons | 139 tons | 291 tons | 622 tons | 97 tons    |

## **Construction Waste - 272 tons**

About 6% of the total waste received was from new construction sources. Construction waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. The construction loads tended to be lighter, less weathered, more homogeneous (all wood, dry wall, etc), and contained more cardboard boxes (usually from fixtures) than the demolition waste loads.

Total construction waste received during the observation period was 272 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

| Construction Waste Components |        |  |  |  |
|-------------------------------|--------|--|--|--|
|                               | Other  |  |  |  |
|                               | 1%     |  |  |  |
| S                             | 4 tons |  |  |  |
| S                             |        |  |  |  |

## **Demolition Waste - 741 Tons**

About 17% of the total waste were from demolition sources. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. The wood was more weathered, there was very little if any cardboard, and there was more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste as compared to the construction waste. At most landfills, roofing shingles were delivered without many other

materials mixed within. However at Southeast most roofing loads were mixed with wood shakes.

Total demolition waste received during the observation period was 741 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed below.

#### The Demolition Waste Component

| Wood     | Dry Wall | Roof     | Masonry  | Metal   | Carpet  | Other   |
|----------|----------|----------|----------|---------|---------|---------|
| 34%      | 7%       | 25%      | 27%      | 2%      | 2%      | 1%      |
| 254 tons | 55 tons  | 190 tons | 204 tons | 15 tons | 16 tons | 11 tons |

## Industrial Waste - 448 tons

About 10% of the total waste stream was from industrial sources. Industrial waste loads were usually transported to the landfill in open top roll-off containers or compactor units. They were normally homogeneous, containing a single waste products from a manufacturing process. These loads came from a variety of sources.

Total industrial waste received during the observation period was 448 tons. The materials within the industrial waste stream were estimated as they were unloaded. These estimated materials are listed below.

#### The Industrial Waste Component

| Cardbrd  | Paper   | Food    | Metal  | Wood     | Plas.   | Tex.   | Rbr.   | Other   |
|----------|---------|---------|--------|----------|---------|--------|--------|---------|
| 34%      | 8%      | 11%     | 1%     | 24%      | 13%     | 0%     | 0%     | 8%      |
| 153 tons | 37 tons | 50 tons | 4 tons | 107 tons | 59 tons | 0 tons | 0 tons | 38 tons |

# Other Waste - 1002 tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items include furniture, mattresses, appliances, etc.. Most of the other waste was contaminated soil. The contaminated soil came from two sources. The City of Kansas City Street Department delivered 534 tons of dirt, rock and asphalt. A remediation project in Kansas City brought in 321 tons of contaminated soil. Both the Contaminated soil and the dirt from the street dept. was unloaded next to the landfill face and used for daily cover. About 81 tons of asbestos was received and disposed of properly at the landfill during the observation period.

Total other waste received during the observation period was 1002 tons. The materials within the other waste stream were estimated, as they were unloaded. These estimated materials are listed below.

#### The Other Waste Component

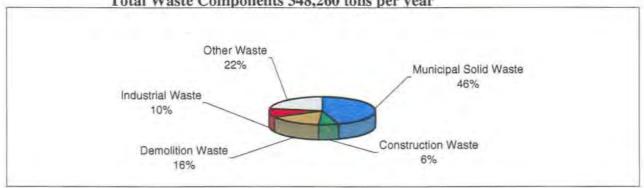
| Bulky   | Contaminated Soil | Asbestos |  |
|---------|-------------------|----------|--|
| 7%      | 85%               | 8%       |  |
| 66 tons | 855 tons          | 81 tons  |  |

# SOUTHEAST (KC) LANDFILL 348,260 TONS IN 1998

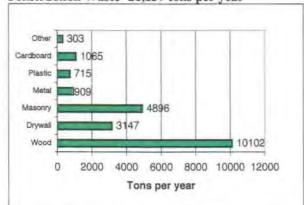
| MATERIAL                 | Tons received during observation period  | Percent of each<br>material received | Estimated received in |             |
|--------------------------|--|--------------------------------------|-----------------------|-------------|
| MSW Component            | and the same of th |                                      |                       | observation |
| Paper                    | 753 Tons   | 16.8%                                | 58,515                |             |
| Glass                    | 117 Tons   | 2.6%                                 |                       | Tons        |
| Metals                   | 139 Tons   | 3.1%                                 | 10,802                |             |
| Plastics                 | 291 Tons   | 6.5%                                 | 22,613                |             |
| Organics                 | 622 Tons   | 13.9%                                | 48,335                |             |
|                          | 97 Tons  | 2.2%                                 |                       | Tons        |
| Inorganics<br>TOTAL MSW  | 2019 Tons  | 45.1%                                | 156,894               |             |
| Construction Waste       |  |                                      |                       |             |
| Wood                     | 130 Tons   | 2.9%                                 | 10,102                | Tons        |
| Dry Wall                 | 41 Tons  | 0.9%                                 | 3,147                 | Tons        |
| Masonry                  | 63 Tons  | 1.4%                                 |                       | Tons        |
| Metal                    | 12 Tons  | 0.3%                                 |                       | Tons        |
| Plastic                  | 9 Tons   | 0.2%                                 |                       | Tons        |
| Cardboard                | 14 Tons  | 0.3%                                 |                       | Tons        |
| Other                    | 4 Tons   | 0.1%                                 |                       | Tons        |
| TOTAL CONSTRUCTION       | 272 Tons   | 6.1%                                 | 21,137                |             |
| TOTAL CONSTRUCTION       | 2/2 10/15  | 0.176                                | 21,137                | 10115       |
| Demolition Waste         |  |                                      |                       |             |
| Wood                     | 253 Tons   | 5.6%                                 | 19,660                | Tons        |
| Dry Wall                 | 55 Tons  | 1.2%                                 | 4,305                 | Tons        |
| Roofing                  | 188 Tons   | 4.2%                                 | 14,609                | Tons        |
| Masonry                  | 203 Tons   | 4.5%                                 | 15,775                | Tons        |
| Metal                    | 15 Tons  | 0.3%                                 | 1,197                 | Tons        |
| Carpet                   | 16 Tons  | 0.3%                                 | 1,204                 | Tons        |
| Other                    | 11 Tons  | 0.2%                                 | 824                   | Tons        |
| TOTAL DEMOLITION         | 741 Tons   | 16.5%                                | 57,574                | Tons        |
| Industrial Waste         |  |                                      |                       |             |
| Cardboard                | 153 Tons   | 3.4%                                 | 11,889                | Tons        |
| Paper                    | 37 Tons  | 0.8%                                 | 2,860                 | Tons        |
| Food                     | 50 Tons  | 1.1%                                 | 3,862                 | Tons        |
| Metal                    | 4 Tons   | 0.1%                                 | 295                   | Tons        |
| Wood                     | 107 Tons   | 2.4%                                 | 8,315                 | Tons        |
| Plastic                  | 59 Tons  | 1.3%                                 | 4,616                 |             |
| Textiles                 | 0 Tons   | 0.0%                                 |                       | Tons        |
| Rubber                   | 0 Tons   | 0.0%                                 | -                     | Tons        |
| Other                    | 38 Tons  | 0.8%                                 | 2,937                 |             |
| TOTAL INDUSTRIAL         | 448 Tons   | 10.0%                                | 34,775                |             |
| Other Waste              |  |                                      |                       |             |
| Bulky Items              | 66 Tons  | 1.5%                                 | 5,113                 | Tons        |
| Soil and Inert Materials | 855 Tons   | 19.1%                                | 66,441                |             |
| Asbestos                 | 81 Tons  | 1.8%                                 | 6,326                 |             |
| Other                    | 0 Tons   | 0.0%                                 | 0,020                 | Tons        |
| TOTAL OTHER WASTE        | 1002 Tons  | 22.4%                                | 77,880                |             |
| TOTAL WASTE STREAM       | 4482 Tons  | 100%                                 | 348,260               | Tons        |
| TOTAL WASTE STREAM       | 4402 10113   | 10076                                | 040,200               | 10113       |

### Southeast Landfill

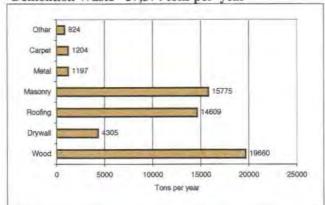
Total Waste Components 348,260 tons per year



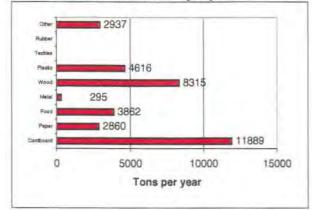
Construction Waste -21,137 tons per year



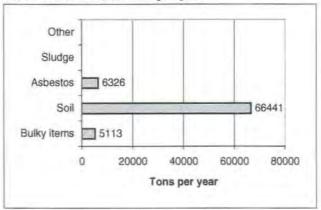
Demolition Waste - 57,574 tons per year



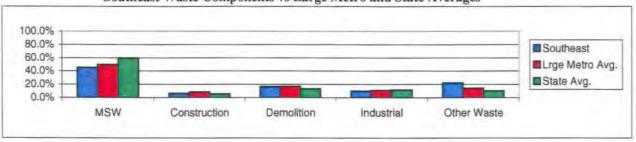
Industrial Waste - 34,775 tons per year



Other Waste - 77,880 tons per year



Southeast Waste Components vs Large Metro and State Averages



## MUNICIPAL SOLID WASTE

#### Introduction

For the purposes of this study municipal solid waste (MSW) is defined as residential, institutional, or commercial waste which is disposed in small containers or plastic bags. This is a somewhat simplistic definition but is inclusive enough to cover most of the materials found in the MSW component. MSW is normally collected in packer trucks that collect from residential, institutional, and commercial generators. In many cases the same truck will collect MSW from all three generators in the same load. MSW is generally delivered to the landfill in packer trucks or transfer trailers. Some rural landfills still receive MSW in open top trucks or trailers.

#### Methodology

The materials within the MSW component are difficult to characterize because the items are small, and in most cases they are concealed within plastic trash bags. Therefore MSW must be hand sorted into material categories in order to gain accurate data. The results of that characterization (the percentage of all materials that make up the MSW component) were applied to MSW loads observed at the landfills. The methodology used to characterize the materials in the MSW component is described below.

#### Sampling

Samples of MSW were taken from commercial waste haulers at a landfill or transfer station in each of the 19 solid waste management districts throughout Missouri. Three seasonal sorts were conducted at each facility. A map of the solid waste management districts is on page 95 and a map of sort locations is on page 96. Samples were selected at random and analyzed during three seasonal waste sorts conducted over a two-year period at each location. The randomly selected waste haulers served only residential, institutional, and commercial accounts. No construction and demolition wastes, sewage sludge, bulky items, combustion ash, industrial process waste, or "other waste" was sampled.

Each sample consisted of 25 bags of waste chosen at random. Bagged waste was selected for two reasons. First, the equipment needed to select scoop loads of waste, and buildings that such equipment could enter and deposit the waste, was non existent at virtually all of the sort locations. Second, and more important, bagged waste provided a more representative sample of the MSW component.

Between February 1996 and October 1997, 632 samples of waste were sorted into 26 material categories and 16 "other waste" categories. The categories are listed on page 97. The bags of MSW were taken to a sorting area where they were opened and the materials sorted into identical 20-gallon containers. After all materials were sorted from a sample the 20-gallon containers were weighed, volumes estimated, and the data recorded. The chart on the following page depicts the summary of all samples. All weights are in pounds, all volumes in cubic feet, and the composition was estimated by the waste hauler. For further information on the MSW sorts see *The Missouri Waste Composition Study: MSW Phase I.* 

# MSW Sample Summary

| Location                  | Number of        | Total of     | all Samples  | Comp         | osition  |
|---------------------------|------------------|--------------|--------------|--------------|----------|
|                           | Samples          | Weight       | Volume       | Res.         | Comm.    |
| Dist. A: Maryville        | 34               | 7,368        | 1,854        | 98%          | 2%       |
| Dist. B: Mooresville      | 32               | 8,179        | 1,535        | 55%          | 45%      |
| Dist. C: Kirksville       | 24               | 5,539        | 1,150        | 66%          | 34%      |
| Dist. D: St. Joseph       | 30               | 7,162        | 1,613        | 87%          | 13%      |
| Dist. E: Lee's Summit     | 35-              | 8,486        | 1,640        | 86%          | 14%      |
| Dist. F: Sedalia          | 29               | 6,186        | 1,296        | 70%          | 30%      |
| Dist. G: Macon            | 24               | 5,786        | 1,199        | 70%          | 30%      |
| Dist H: Columbia          | Conducted by the | e University | of Missouri. | Results on p | page 113 |
| Dist. I: Foristell        | 36               | 7,849        | 1,760        | 86%          | 14%      |
| Dist. J: Clinton          | 28               | 6,342        | 1,331        | 71%          | 29%      |
| Dist. K: Phelps Co.       | 33               | 6,590        | 1,491        | 87%          | 13%      |
| Dist. L: St. Louis        | 40               | 7,149        | 1,642        | 100%         | 0%       |
| Dist. M: Lamar            | 38               | 8,064        | 1,774        | 53%          | 47%      |
| Dist. N: Reeds Spring     | 40               | 9,282        | 2,032        | 43%          | 57%      |
| Dist. O: Springfield      | 32               | 7,078        | 1,547        | 90%          | 10%      |
| Dist, P: West Plains      | 34               | 7,384        | 1,623        | 60%          | 40%      |
| Dist. Q: Butler Co.       | 32               | 8,145        | 1,685        | 84%          | 16%      |
| Dist. R: St. Francois Co. | 39               | 8,854        | 1,877        | 87%          | 13%      |
| Dist. S: Pemiscot Co.     | 40               | 8,342        | 1,831        | 81%          | 19%      |
| Dist. T: Osage Beach      | 32               | 6,797        | 1,517        | 77%          | 23%      |
| TOTAL                     | 632              | 140,581      | 30,399       | 78%          | 22%      |

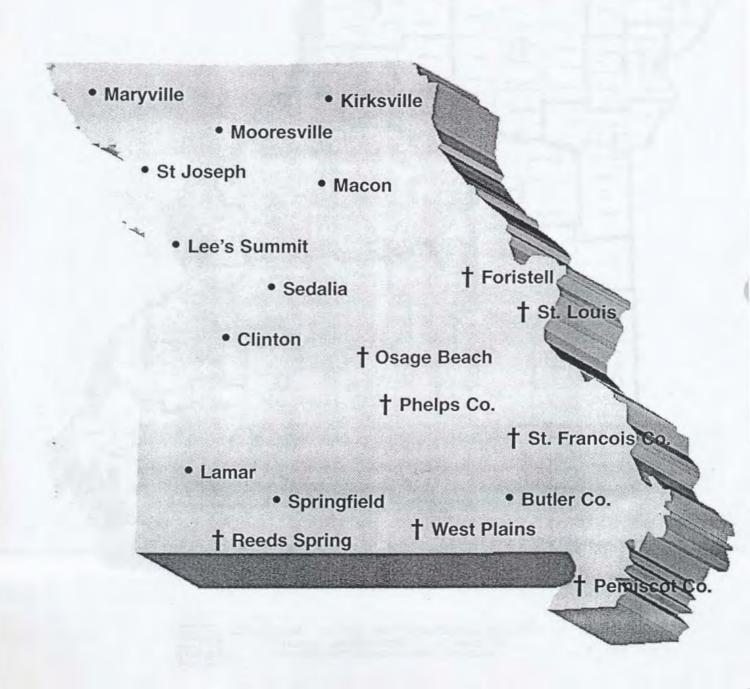
# SOLID WASTE MANAGEMENT REGIONS OF MISSOURI



MISSOURI DEPARTMENT OF NATURAL RESOURCES DIVISION OF ENVIRONMENTAL QUALITY SOLID WASTE MANAGEMENT PROGRAM



# Missouri Waste Composition Study Sort Locations



#### Sort Categories

The following categories, and sub categories were used during the waste sorts at all locations. The "Other Waste" category was separated into the sub categories listed and recorded separately.

#### Paper

Cardboard and Kraft Paper- Non waxed corrugated cardboard (OCC), box board, and Kraft paper.

Newsprint-. Printed groundwood paper.

Magazines- Periodicals, or bound printed material including glossy and plain paper stocks.

High Grade Paper- Paper that is recyclable and consistently has a positive market value

Mixed Paper- All paper that does not fit into the categories specified above

#### Glass

Clear Glass Containers- Clear glass that originally contained food or beverage.

Brown Glass Containers- Brown glass which originally contained food or beverages.

Green and Blue Glass Containers- Green or blue cast glass which originally contained food or beverage.
Other Glass- Glass that was not originally a food or beverage container and glass broken beyond recognition.

#### Metals

Aluminum Cans- All aluminum beverage containers.

Other Aluminum- All aluminum except beverage containers.

Ferrous Food Cans- Any steel food containers, including pet food cans and aerosol cans.

Other Ferrous- Ferrous and alloyed ferrous scrap to which a magnet attracted.

Other Non-Ferrous- All nonmagnetic metals that are not recognizable as aluminum.

Oil Filters- Used and new oil filters for automobiles.

#### Plastics

PET (#1)- Beverage bottles composed of polyethylene terephthalate. Other containers clearly labeled PET (#1).

HDPE (#2)- High-density polyethylene containers...

Plastic Film- Includes all flexible plastic film regardless of resin content.

Other Plastic- Includes: PVC (#3), LDPE (#4), PP (#5), PS (#6), other plastics or mixed resins (#7), and unidentifiable plastics.

#### Organics

Food Waste- Putrescibles. Material capable of being decomposed by microorganisms with sufficient rapidity as to cause nuisances from odors and gases.

Wood Waste- Includes small wooden furniture, wooden tool handles, boards, plywood and particleboard.

Textiles- All woven fabric, natural or synthetic, either in bulk or made into usable items.

Disposable Diapers- Adult or infant disposable diapers, clean or soiled.

Other Organics- Those items which do not fall into any other category and which are composed of carbon-based material.

#### Inorganics

Fines- All matter not sorted into specific categories that are too small or mixed to be categorized.

Other Inorganics- Those items which do not fall into any other category and are composed of inert materials.

#### Other Potentially Hazardous MSW Waste

Items that are potentially hazardous to solid waste handlers or ecosystems: These items include overthe-counter medicine (OTC), prescription medication (Rx), beauty/hygiene products, beauty/hygiene aerosol products, household cleaning products, household cleaning aerosol products, aerosol cans, sharps/blades, syringes and needles, hardware/shop products, gardening/yard products, disposable razors, alkaline batteries, miscellaneous hazardous or toxic items. Definition of each of these items is on page 121.

#### Results

Three seasonal waste sorts were scheduled at each of the sort locations. A tent was erected at each site and all waste was transported to the tent where it was sorted into material categories. Weather was a factor at several of the waste sorts. High winds, heavy rains, snow and ice caused some sort activities to be shortened, but only one sort (round one at District G) was cancelled due to weather. The sorting dates are listed in the table below:

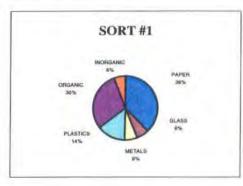
| Location                  | First Round<br>Sorting dates | Second Round<br>Sorting dates | Third Round<br>Sorting dates |
|---------------------------|------------------------------|-------------------------------|------------------------------|
| Dist. A: Maryville        | 3/18-3/20/96                 | 6/24-6/26/96                  | 10/21-10/23/96               |
| Dist. B: Mooresville      | 3/17-3/18/97                 | 6/11-6/12/97                  | 9/15-9/17/97                 |
| Dist. C: Kirksville       | 3/24-3/25/97                 | 6/16-6/17/97                  | 9/8-9/10/97                  |
| Dist. D: St. Joseph       | 3/10-3/11/97                 | 6/9-6/10/97                   | 9/18/9/20/97                 |
| Dist. E: Lee's Summit     | 3/25-3/2796                  | 7/1-7/3/96                    | 10/28-10/30/96               |
| Dist. F: Sedalia          | 3/6-3/7/97                   | 5/21-5/22/97                  | 9/22-9/24/97                 |
| Dist. G: Macon            | Cancelled                    | 6/10-6/12/96                  | 10/7-10/9/96                 |
| Dist H: Columbia          | Conducted by the Uni         | versity of Missouri. R        | esults on page 113           |
| Dist. I: Foristell        | 3/31-4/1/97                  | 6/23-6/24/97                  | 9/2/9/4/97                   |
| Dist. J: Clinton          | 4/1/-4/3/96                  | 7/8-7/10/96                   | 11/4-11/6/96                 |
| Dist. K: Phelps Co.       | 4/7-4/8/97                   | 5/15-5/16/97                  | 9/29-10/1/97                 |
| Dist. L: St. Louis        | 3/11-3/13/96                 | 6/17-6/19/96                  | 9/30-10/2/96                 |
| Dist. M: Lamar            | 4/8-4/10/96                  | 7/15-7/17/96                  | 11/11-11/13/96               |
| Dist. N: Reeds Spring     | 2/12-2/14/96                 | 5/20-5/22/96                  | 9/9-9/11/96                  |
| Dist. O: Springfield      | 2/5-2/7/96                   | 5/13-5/15/96                  | 9/3/-9/5/96                  |
| Dist. P: West Plains      | 2/10-2/11/97                 | 5/5-5/6/97                    | 10/6-10/8/97                 |
| Dist. Q: Butler Co.       | 2/3-2/4/97                   | 4/28-4/29/97                  | 10/13-10/15/97               |
| Dist. R: St. Francois Co. | 2/26-2/28/96                 | 6/3-6/5/96                    | 9/23-9/25/96                 |
| Dist. S: Pemiscot Co.     | 2/19-2/21/96                 | 5/28-5/30/96                  | 9/16-9/18/96                 |
| Dist. T: Osage Beach      | 2/24-2/25/97                 | 5/19-5/20/97                  | 9/25-9/27/97                 |

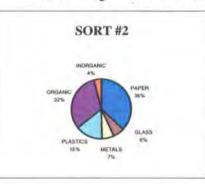
#### Seasonal Changes in the Waste Component

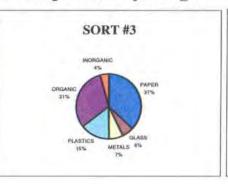
The table on page 99 reflects the percentage of materials found in the MSW (by weight) component during the three seasonal sorts. The seasonal sort average is based on the total weight of that material, divided by the total weight sorted during that round. The average of all sorts is the total weight of each material, divided by the total weight of all materials sorted during the entire study. The pie charts on page 101 compares the percentages in each major category found during each of the seasonal sorts and the bar graph illustrates the average percentage of each material found during the sorting process.

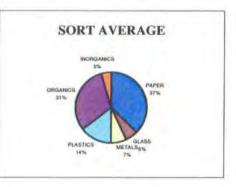
|                  | Seasonal |          |         |         |  |  |  |  |  |
|------------------|----------|----------|---------|---------|--|--|--|--|--|
|                  | SORT # 1 | SORT # 2 | SORT #3 | AVERAGE |  |  |  |  |  |
|                  | WT.      | WT.      | WT.     | WT.     |  |  |  |  |  |
| CATEGORY         |          |          |         |         |  |  |  |  |  |
| Cardboard        | 6.6%     | 6.8%     | 6.6%    | 6.7%    |  |  |  |  |  |
| Newsprint        | 7.4%     | 8.0%     | 8.3%    | 7.9%    |  |  |  |  |  |
| Magazines        | 3.5%     | 3.4%     | 4.3%    | 3.7%    |  |  |  |  |  |
| High Grade       | 3.2%     | 3.8%     | 3.6%    | 3.6%    |  |  |  |  |  |
| Mixed            | 17.1%    | 15.1%    | 14.2%   | 15.5%   |  |  |  |  |  |
| PAPER TOTALS     | 37.8%    | 37.1%    | 36.9%   | 37.3%   |  |  |  |  |  |
| Clear            | 3.2%     | 3.2%     | 3.1%    | 3.2%    |  |  |  |  |  |
| Brown            | 1.5%     | 1.7%     | 1.5%    | 1.5%    |  |  |  |  |  |
| Green            | 0.5%     | 0.4%     | 0.4%    | 0.4%    |  |  |  |  |  |
| Other            | 0.5%     | 0.6%     | 0.6%    | 0.6%    |  |  |  |  |  |
| GLASS TOTALS     | 5.7%     | 5.9%     | 5.7%    | 5.8%    |  |  |  |  |  |
| Alum. Cans       | 1.4%     | 1.6%     | 1.6%    | 1.5%    |  |  |  |  |  |
| Other Alum       | 0.7%     | 0.8%     | 0.8%    | 0.8%    |  |  |  |  |  |
| Non ferrous      | 0.2%     | 0.3%     | 0.2%    | 0.2%    |  |  |  |  |  |
| Food Cans        | 3.4%     | 2.7%     | 3.3%    | 3.1%    |  |  |  |  |  |
| Ferrous          | 1.0%     | 1.1%     | 1.3%    | 1.1%    |  |  |  |  |  |
| Oil Filters      | 0.2%     | 0.1%     | 0.1%    | 0.1%    |  |  |  |  |  |
| METAL TOTALS     | 6.9%     | 6.6%     | 7.2%    | 6.9%    |  |  |  |  |  |
| PET #1           | 1.7%     | 1.6%     | 1.7%    | 1.7%    |  |  |  |  |  |
| HDPE # 2         | 1.9%     | 2.0%     | 2.4%    | 2.1%    |  |  |  |  |  |
| Film             | 4.0%     | 3.7%     | 3.5%    | 3.7%    |  |  |  |  |  |
| Other Plastic    | 6.6%     | 7.2%     | 6.9%    | 6.9%    |  |  |  |  |  |
| PLASTIC TOTALS   | 14.1%    | 14.7%    | 14.5%   | 14.4%   |  |  |  |  |  |
| Food Waste       | 18.0%    | 18.9%    | 19.2%   | 18.7%   |  |  |  |  |  |
| Wood Waste       | 0.8%     | 0.7%     | 0.9%    | 0.8%    |  |  |  |  |  |
| Textiles         | 3.6%     | 4.4%     | 3.9%    | 4.0%    |  |  |  |  |  |
| Diapers          | 4.7%     | 3.9%     | 3.9%    | 4.2%    |  |  |  |  |  |
| Other Organics   | 2.5%     | 3.8%     | 3.3%    | 3.2%    |  |  |  |  |  |
| ORGANIC TOTALS   | 29.6%    | 31.7%    | 31.2%   | 30.8%   |  |  |  |  |  |
| Fines            | 4.4%     | 2.5%     | 2.9%    | 3.3%    |  |  |  |  |  |
| Other Inorganics | 1.5%     | 1.6%     | 1.4%    | 1.5%    |  |  |  |  |  |
| INORGANIC TOTALS | 5.9%     | 4.1%     | 4.4%    | 4.8%    |  |  |  |  |  |
| SORT TOTALS      | 100%     | 100%     | 100%    | 100%    |  |  |  |  |  |

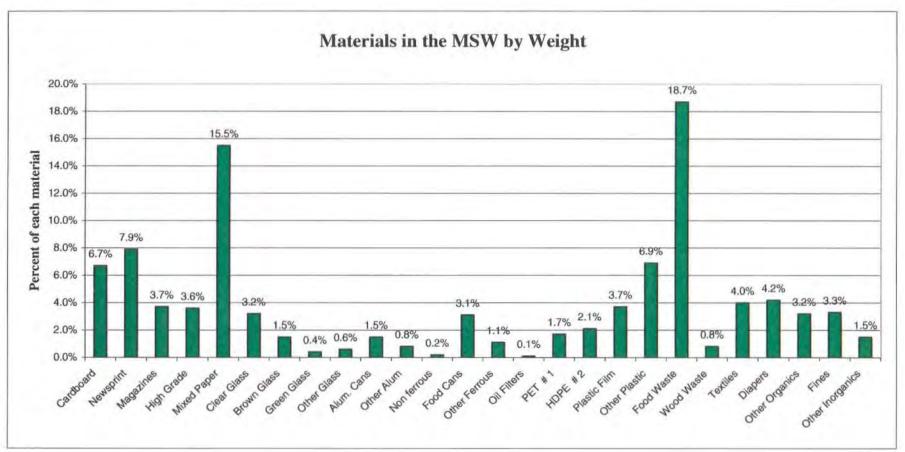
# **Municipal Solid Waste Composition By Weight**











#### Chronological Changes in the Waste Component

Just as society changes over time, the waste component also changes. In 1987 The Missouri Environmental Improvement and Energy Resources Authority (EIERA) conducted the *Statewide Resource Recovery Feasibility and Planning Study*. Part of that study involved conducting two seasonal waste sorts for MSW at four Missouri landfills. The four landfills were the City of Springfield, the City of Lee's Summit, the City of Columbia, and the City of Willow Springs. Many communities and solid waste management districts have used the results of those 1987 waste sorts. However several changes have taken place in the solid waste environment since 1987.

As part of the *Missouri Waste Composition Study*, waste sorts were conducted at the City of Springfield, and the City of Lee's Summit landfill's in 1996. The University of Missouri conducted an independent waste characterization study at the City of Columbia's landfill in 1996 (results on page 113), and the City of Willow Spring's landfill is closed.

One result of the 1987 EIERA study was the passage of Senate Bill 530 in 1990. This bill contained legislation pertaining to landfill permitting requirements, set state-wide goals for solid waste recovery and reduction, banned certain items from Missouri landfills, set up a solid waste management fund, and provided for the development of Solid Waste Management Districts.

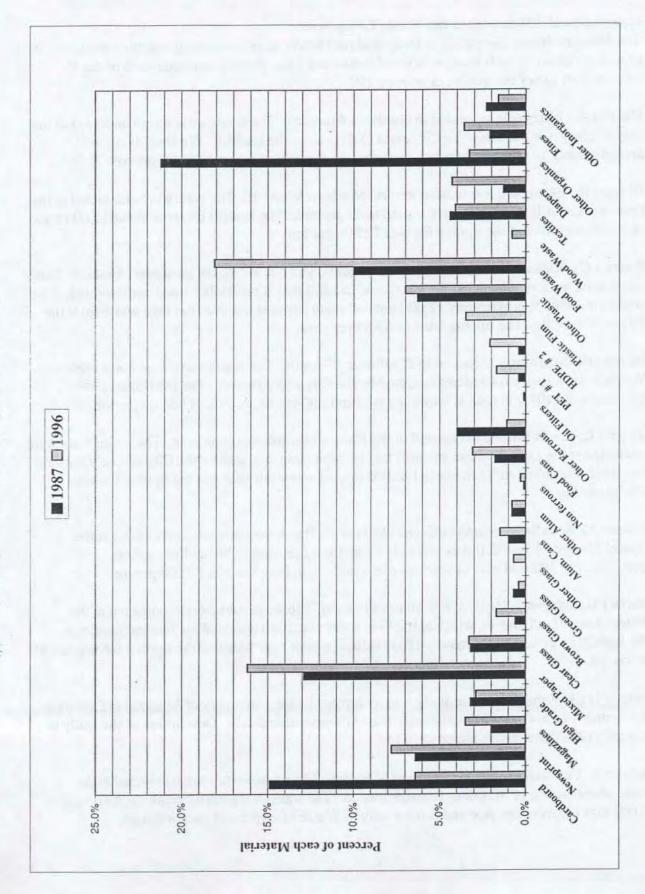
Many of the items, which were in the MSW component in 1987, are not present today. Major appliances (white goods), waste oil, whole tires, lead acid batteries, and yard waste or clippings have been banned from Missouri landfills and transfer stations. Programs have since been implemented to dispose of these items in a more responsible manner. In 1987 yard waste comprised 8.3% of the waste component (this actually varied from 1% at a rural location to 17% in the suburbs). For comparative purposes the 1987 yard waste percentages were added to the "other organics" sub category. In 1987 white goods were counted as other ferrous, lead acid batteries were counted as other waste, and tires were counted as other organics.

Changes in technology, products, and packaging also change over time and the waste component reflects these changes. The Table on page 104 and the chart on page 105 illustrate the changes in the waste stream between 1987 and 1996.

- Cardboard is about one half of what it was in 1987. This is probably a result of increased cardboard recycling and a difference in sampling procedures between the two studies.
- All plastic resins have increased. PET and HDPE have increased 500% during the past 10 years. Other plastics (plastic film included) have increased by 50%.
- The increase in food waste (120%) is probably a result in different sampling procedures between the two studies. The 1987 study put food-contaminated paper into the other organics category rather than the food waste category. The growth of fast food restaurants may also have some affect on this increase.
- The increase in disposable diapers (188%) is probably a result of society's preference of disposable baby diapers over cloth, and the increased usage of adult diapers among the elderly.
- The decrease in the 1987 "other organics" category reflects the ban on yard waste and tires, and a separate category to measure wood waste.

# Changes in the Waste Stream Over Time

|                  | 1987  | 1996-97  |
|------------------|-------|----------|
| CATEGORY         | EIERA | Missouri |
|                  | % wt. | % wt.    |
| Cardboard        | 15.1% | 6.7%     |
| Newsprint        | 6.6%  | 7.9%     |
| Magazines        | 1.7%  | 3.7%     |
| High Grade       | 3.2%  | 3.6%     |
| Mixed            | 12.7% | 15.5%    |
| PAPER TOTALS     | 39.4% | 37.3%    |
| Clear            | 3.0%  | 3.2%     |
| Brown            | 0.8%  | 1.5%     |
| Green            | 0.7%  | 0.4%     |
| Other            | N/A   | 0.6%     |
| GLASS TOTALS     | 4.5%  | 5.8%     |
| Alum. Cans       | 1.0%  | 1.5%     |
| Other Alum       | 0.5%  | 0.8%     |
| Non ferrous      | 0.1%  | 0.2%     |
| Food Cans        | 2.0%  | 3.1%     |
| Ferrous          | 3.5%  | 1.1%     |
| Oil Filters      | N/A   | 0.1%     |
| METAL TOTALS     | 7.0%  | 6.9%     |
| PET #1           | 0.4%  | 1.7%     |
| HDPE #2          | 0.3%  | 2.1%     |
| Film             | N/A   | 3.7%     |
| Other Plastic    | 7.1%  | 6.9%     |
| PLASTIC TOTALS   | 7.7%  | 14.4%    |
| Food Waste       | 8.3%  | 18.7%    |
| Wood Waste       | N/A   | 0.8%     |
| Textiles         | 3.9%  | 4.0%     |
| Diapers          | 1.5%  | 4.2%     |
| Other Organics   | 21.6% | 3.2%     |
| ORGANIC TOTALS   | 35.3% | 30.8%    |
| Fines            | 2.9%  | 3.3%     |
| Other Inorganics | 2.9%  | 1.5%     |
| INORGANIC TOTALS | 5.8%  | 4.8%     |
| TOTAL            | 99.6% | 100.0%   |



Geographical differences in the Waste Component

The Missouri Waste Composition Study analyzed MSW at 19 locations throughout the state. A brief description of each location is listed below and a bar charts comparing each of the 19 locations, by major categories, is on page 109

District A: Maryville is located in Northeast Missouri. The waste sorts were conducted at the City of Maryville landfill. The City owns and operates the landfill. The landfill receives approximately 12,000 tons of waste per year and the tipping fee was \$60.00 per ton.

**District B:** Mooresville is located in rural Northern Missouri. The sorts were conducted at the Farmer's Landfill that is privately owned and operated. The landfill receives about 19,000 tons of waste per year and the tipping fee was \$25.00 per ton.

District C: Kirksville is located in Adair County, which is located in northeast Missouri. The waste sorts were conducted at the Rye Creek Landfill that is privately owned and operated. The landfill receives approximately 12,000 tons of waste per year but does not take waste from the City of Kirksville. The tipping fee was \$6.50 per yard.

**District D: St. Joseph** is located in Northwest Missouri. The waste sorts were conducted St. Joseph landfill that is owned and operated by the City of St. Joseph. The landfill receives approximately 104,000 tons of waste per year and the was tipping fee is \$24.00 per ton.

District E: Lee's Summit is located in the Kansas City metropolitan area. The waste sorts were conducted at the Lee's Summit Landfill that is owned and operated by the City of Lee's Summit. The landfill receives approximately 110,000 tons of waste per year and the tipping fee was \$23.00 per ton.

District F: Sedalia is located in Central Missouri. The waste sorts were conducted at the Central Missouri Landfill that is privately owned and operated. The landfill receives approximately 102,000 tons of waste per year and the tipping fee was \$25.00 per ton.

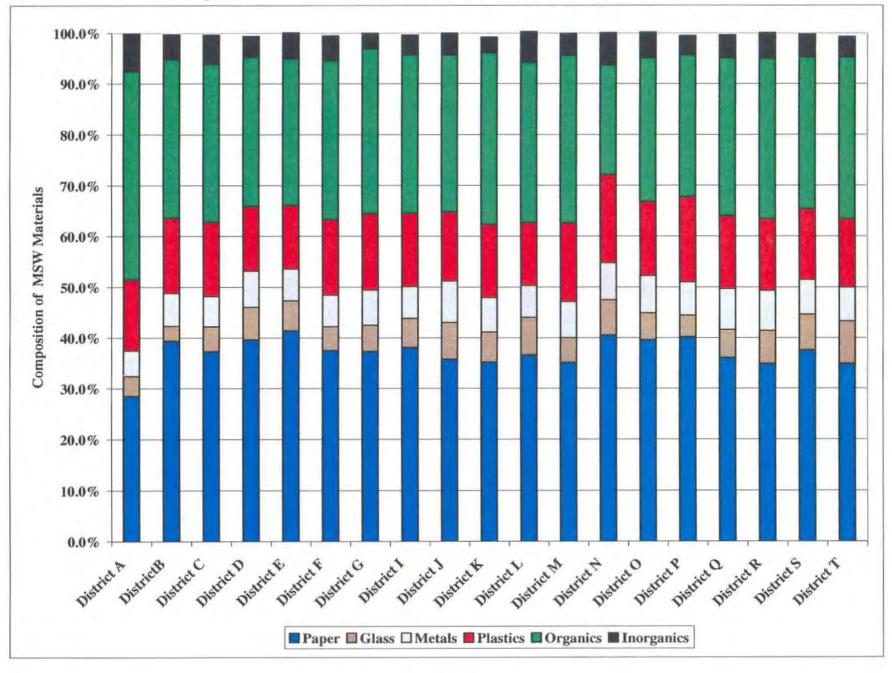
**District G: Macon** is located in Northern Missouri. The waste sorts were conducted at the Teeters Sanitation Landfill, which at the time was owned and operated by Teeters Sanitation. The landfill receives approximately 120,000 tons of waste per year and the tipping fee was \$6.50 per cu. yd.

**District H:** Columbia's waste study was performed by the University of Missouri at Columbia and as such was not part of the *Missouri Waste Composition Study*. Description of the study is on page 112 and the results are on pg. 113.

**District I:** Foristell is located in Eastern Missouri. The waste sorts were conducted at the Waste Management of St. Louis Transfer Station. The transfer station receives approximately 57,000 tons of waste per year and is open only to Waste Management packer trucks.

- **District J: Clinton** is located in West Central Missouri. The waste sorts were conducted at the Ellis Scott landfill that was owned and operated by USA Waste Inc. The landfill receives approximately 55,000 tons of waste per year and the tipping fee was \$23.25 per ton.
- **District K:** Phelps County is located in Central Missouri. The waste sorts were conducted at the Phelps County Transfer Station that is owned by the County. The transfer station receives approximately 50,000 tons of waste per year and the tipping fee was \$43.81 per ton.
- **District L: St. Louis** is located in Eastern Missouri. The waste sorts were conducted at the South St. Louis Transfer Station that is owned by the City but operated by Allied Waste. The transfer station receives approximately 177,000 tons of waste and fees are assessed internally.
- **District M:** Lamar is located in Southwest Missouri. The waste sorts were conducted at the Lamar Landfill that is owned and operated by BFI Inc. The landfill receives approximately 170,000 tons of waste per year and the tipping fee was \$22.75 per ton.
- **District N:** Reeds Spring is located in Southwest Missouri. The waste sorts were conducted at the Reed's Spring Transfer station that is operated by American Disposal. The transfer station receives approximately 66,000 tons of waste per year and the tipping fee was \$44.00 per ton.
- **District O:** Springfield is located in Southwest Missouri. The waste sorts were conducted at the City of Springfield landfill that is owned and operated by the City. The landfill receives approximately 100,000 tons of waste per year and the tipping fee was \$27.50 per ton.
- **District P:** West Plains is located in South Central Missouri. The waste sorts were conducted at the West Plains Transfer Station. The transfer station is owned and operated by the City. It receives approximately 12,000 tons of waste per year and the tipping fee was \$40.00 per ton.
- **District Q: Butler County** is located in the Southeastern Missouri. The waste sorts were conducted at the Butler County Landfill that is operated by Allied Waste. The landfill receives approximately 120,000 tons of waste per year and the tipping fee was \$32.00 per ton.
- **District R: St. Francois County** is located in Eastern Missouri. The waste sorts were conducted at the St. Francois Co. Transfer Station that is owned and operated by the County. The transfer station receives approximately 20,000 tons of waste per year and the tipping fee was \$42.00 per ton.
- **District S: Pemiscot County** is located in Southeast Missouri. The waste sorts were conducted at the Pemiscot County Transfer Station that is owned and operated by the County. The transfer station receives approximately 15,000 tons of waste per year and the tipping fee was \$32.50 per ton.
- **District T:** Osage Beach is located at the Lake of the Ozarks in Central Missouri. The waste sorts were conducted at the Modern Sanitation Transfer Station. The transfer station receives approximately 20,000 tons of waste per year and the tipping fee was \$44.00 per ton.

# Composition of MSW Within Each Solid Waste Management District



# Differences between The Missouri Waste Composition Study and other state waste composition studies

Several waste composition studies have been conducted during the past ten years. Virtually all waste composition studies use different methodology. Therefore comparing results is difficult and not entirely reliable. Differences in methodology depend on a number of variables. The *Missouri Waste Composition Study* chose a limited scope and sampled bagged waste in order to characterize the largest (MSW) portion of the waste component. Most waste composition studies use a "random scoop" method and hope to characterize the entire waste component (MSW, industrial, C&D, bulky items, etc.). Both approaches are appropriate but care must be taken to understand the underlying methodology of each study, especially the sampling methodology, before arguing too intently over waste percentages.

Another problem in comparing waste composition studies is that most studies chose different waste categories or defined their categories differently. The differences in categories makes comparisons somewhat difficult but not impossible. For purposes of comparison and standardization, the major waste categories used in the *Missouri Waste Composition Study* (page 97) are used in the chart on page 113.

The Missouri Statewide Resource Recovery Feasibility and Planning Study: EIERA 1987
This was the first statewide waste composition study done in Missouri. Two seasonal sorts were conducted at four landfills throughout the state. The four landfills were the City of Springfield, the City of Lee's Summit, the City of Columbia, and the City of Willow Springs. The waste sorts were performed before yard waste was banned in Missouri, therefore yard waste is included in the "other organics" sub category. This comparison indicates how the Missouri waste component has changed over the past ten years. The chart on page 11 also displays the changes in the waste component between 1987 and 1997

#### Oregon Solid Waste Characterization and Composition 1992-93

The study was conducted by the Matrix Management Group and consisted of four seasonal sorts of residential and commercial waste. A total of 823 samples weighing 200 to 300 pounds each were collected at disposal sites in 10 counties during all four quarters of the year. The waste was sorted into 83 categories, so many of those categories were combined for comparison purposes. Oregon had an extensive waste reduction and recycling program in place before, and during, the waste sorts. Yard waste was not banned from landfills and is included as "other organics".

#### The Minnesota Solid Waste Composition Study 1990-1992

The Minnesota study was conducted by the Minnesota Pollution Control Agency. It consisted of four seasonal waste sorts conducted over a two-year period. The results found on page 20 are the average of sorts conducted throughout 1991 and 1992. Samples were taken from residential and commercial waste haulers. During the year, 1,119 samples weighing 343,007 pounds were sorted. The methodology for this study was used in planning the *Missouri Waste Composition Study*.

Waste Characterization Study for the City of Columbia Sanitary Landfill 1996

This study was designed and conducted by the University of Missouri at Columbia in cooperation with the City of Columbia. Waste sorts were conducted during each of the four quarters (or seasons) of 1996 at the City of Columbia Sanitary Landfill. Weight fractions of 32 waste components were quantified from the surrounding area. To accomplish this, 127 to 151 samples, with an average weight of 306 pounds were collected each quarter. The number of samples was determined using ASTM Standard D5231-92 to achieve 80% confidence that the true weight-fraction mean would lie within 10% of the measured mean. Standard errors and percent errors were reported at the 80% and 90% confidence levels. The results on page 114 are from the residential waste component in the City of Columbia, which is the only community in the State of Missouri with a deposit law (bottle bill) in effect.

Characterization of Municipal Solid Waste in the United States: 1996 update

This study was funded, and distributed by the Environmental Protection Agency. It is better known in solid waste circles as the "Franklin Study". The authors of the study, Franklin and Associates use the "material flows methodology" to determine the composition of solid waste. This methodology is based on production data (by weight) for the materials and products in the waste component, with adjustments for imports, exports, and product lifetimes. The Franklin study defined categories differently than other waste composition studies. Main divisions include durable goods, Non-durable goods, containers and packaging, and other wastes. Materials can be listed in one or more of these major divisions. Every effort was made to maintain accuracy and still fit the "Franklin categories" into the categories used for comparisons.

#### Possible reasons for the differences between the waste composition studies

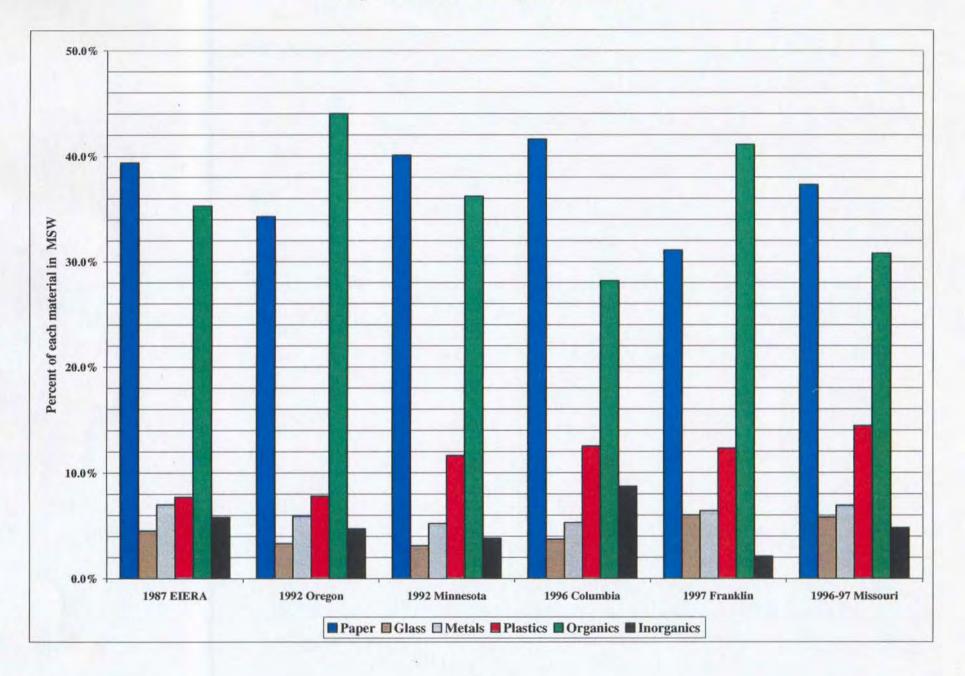
Comparisons between the different waste composition data is interesting. If we assume that the methodology used to conduct the study has provided accurate results, there seem to be two main components that effect the data. These two are banned items and recycling. The items that are banned from disposal in Missouri landfills are:

- · Major appliances (white goods)
- · Waste oil
- Lead-acid batteries
- Yard waste or clippings
- · Whole Tires
- Small quantities of hazardous waste (large quantities were already banned)

The ban on yard waste seems to have a remarkable effect on reducing the amount of organic materials in the waste component. The organic component in the Missouri waste component is considerably lower than the organic materials in the other studies. The most plausible explanation seems to be the lack of yard waste.

Recycling also seems to have an effect on the composition of the waste component. Oregon, and Minnesota had strong recycling programs in effect during their waste sorts. The only Missouri location that has a similar recycling program is the City of Maryville. The percentage of "recyclable material" in the Maryville waste component seems to be comparable to the percentage of "recyclable material" within the Oregon and Minnesota waste component.

# **Comparable MSW Composition Studies**



#### The Volume of the Waste Component

Most solid waste composition studies are recorded by weight. However, in many instances volume of the material may be more significant. Some examples are: calculations for landfill capacities, vehicle and storage space for recyclable materials, and compaction rates for waste haulers. This study attempted to quantify the volume of waste as well as the weight of that waste. During the sorting procedure all materials were placed into identical containers which were three cubic feet in volume. As the container was weighed, the volume of the material within that container was estimated. Both the weight and the volume were recorded on the sample data sheet.

The relationship between weight and volume found during the MSW waste sorts are listed below. These volumes are for uncompacted waste.

| Category             | Pounds per cubic foot | Cubic yards per ton |
|----------------------|-----------------------|---------------------|
| Cardboard            | 2.49                  | 29.7                |
| Newsprint            | 6.42                  | 11.5                |
| Magazines            | 8.51                  | 8.7                 |
| High Grade Paper     | 5.20                  | 14.2                |
| Mixed Paper          | 4.07                  | 18.2                |
| Clear Glass          | 9.97                  | 7.4                 |
| Brown Glass          | 9.39                  | 7.9                 |
| Green Glass          | 8.25                  | 9.0                 |
| Other Glass          | 9.61                  | 7.9                 |
| Aluminum Cans        | 2.61                  | 28.4                |
| Other Aluminum       | 3.61                  | 20.5                |
| Non Ferrous Metals   | 6.50                  | 11.4                |
| Ferrous Food Cans    | 5.27                  | 14.1                |
| Other ferrous Metals | 7.65                  | 9.7                 |
| Oil Filters          | 12.60                 | 5.9                 |
| PET #1 Plastic       | 1.95                  | 38.0                |
| HDPE #2 Plastic      | 1.88                  | 39.4                |
| Plastic Film         | 1.94                  | 38.2                |
| Other Plastics       | 2.46                  | 30.1                |
| Food Waste           | 11.25                 | 6.6                 |
| Wood Waste           | 7.43                  | 10                  |
| Textiles             | 5.28                  | 14                  |
| Diapers              | 8.67                  | 8.5                 |
| Other Organics       | 5.82                  | 8.7                 |
| Fines -              | 8.54                  | 8.7                 |
| Other Inorganics     | 10.66                 | 6.9                 |

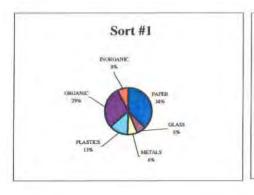
#### Seasonal Changes in the Waste Component

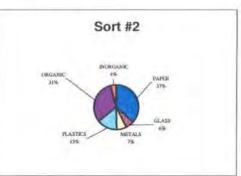
The table on page 116 reflects the percentage of each material found in the MSW (by volume) component during the three seasonal sorts. The seasonal sort average is based on the total volume of that material, divided by the total volume sorted during that round. The pie charts on page 117 compares the percentages in each major category found during each of the seasonal sorts and the bar graph illustrates the average percentage of each material found during the sorting process. The chart on page 119 compares weight percentages to volume percentages.

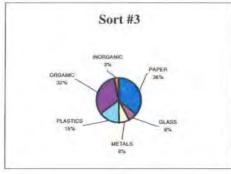
Seasonal Results by Volume

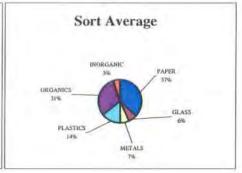
|                  | Seaso    | nai Results by | orume   |         |  |  |  |
|------------------|----------|----------------|---------|---------|--|--|--|
|                  | SORT # 1 | SORT # 2       | SORT #3 | AVERAGE |  |  |  |
| CATEGORY         | VOL.     | VOL.           | VOL.    | VOL.    |  |  |  |
| Cardboard        | 11.8%    | 11.6%          | 11.5%   | 11.6%   |  |  |  |
| Newsprint        | 5.5%     | 5.6%           | 5.7%    | 5.6%    |  |  |  |
| Magazines        | 1.9%     | 1.8%           | 1.9%    | 1.9%    |  |  |  |
| High Grade       | 3.2%     | 3.4%           | 3.4%    | 3.3%    |  |  |  |
| Mixed            | 18.5%    | 17.5%          | 16.9%   | 17.7%   |  |  |  |
| PAPER TOTALS     | 40.9%    | 39.9%          | 39.3%   | 40.1%   |  |  |  |
| Clear            | 1.5%     | 1.3%           | 1.2%    | 1.3%    |  |  |  |
| Brown            | 0.8%     | 0.8%           | 0.7%    | 0.7%    |  |  |  |
| Green            | 0.2%     | 0.2%           | 0.2%    | 0.2%    |  |  |  |
| Other            | 0.3%     | 0.3%           | 0.3%    | 0.3%    |  |  |  |
| GLASS TOTALS     | 2.8%     | 2.5%           | 2.4%    | 2.6%    |  |  |  |
| Alum. Cans       | 2.3%     | 2.8%           | 3.1%    | 2.8%    |  |  |  |
| Other Alum       | 1.2%     | 0.9%           | 1.1%    | 1.1%    |  |  |  |
| Non ferrous      | 0.2%     | 0.2%           | 0.1%    | 0.2%    |  |  |  |
| Food Cans        | 3.1%     | 2.5%           | 2.9%    | 2.8%    |  |  |  |
| Ferrous          | 0.7%     | 0.6%           | 0.7%    | 0.7%    |  |  |  |
| Oil Filters      | 0.0%     | 0.0%           | 0.0%    | 0.0%    |  |  |  |
| METAL TOTALS     | 7.6%     | 7.1%           | 8.0%    | 7.5%    |  |  |  |
| PET #1           | 4.1%     | 3.6%           | 3.9%    | 3.9%    |  |  |  |
| HDPE #2          | 4.8%     | 4.9%           | 5.8%    | 5.1%    |  |  |  |
| Film             | 9.2%     | 8.5%           | 8.5%    | 8.8%    |  |  |  |
| Other Plastic    | 12.4%    | 13.8%          | 13.6%   | 13.3%   |  |  |  |
| PLASTIC TOTALS   | 30.6%    | 30.8%          | 31.8%   | 31.0%   |  |  |  |
| Food Waste       | 6.9%     | 8.4%           | 8.0%    | 7.8%    |  |  |  |
| Wood Waste       | 0.5%     | 0.5%           | 0.6%    | 0.5%    |  |  |  |
| Textiles         | 3.5%     | 3.6%           | 3.3%    | 3.5%    |  |  |  |
| Diapers          | 2.4%     | 2.0%           | 2.0%    | 2.1%    |  |  |  |
| Other Organics   | 2.0%     | 2.9%           | 2.4%    | 2.4%    |  |  |  |
| ORGANIC TOTALS   | 15.4%    | 17.3%          | 16.2%   | 16.3%   |  |  |  |
| Fines            | 2.1%     | 1.7%           | 1.6%    | 1.8%    |  |  |  |
| Other Inorganics | 0.7%     | 0.7%           | 0.6%    | 0.7%    |  |  |  |
| INORGANIC TOTALS | 2.8%     | 2.4%           | 2.2%    | 2.5%    |  |  |  |
| SORT TOTALS      | 100%     | 100%           | 100%    | 100%    |  |  |  |
|                  |          |                |         |         |  |  |  |

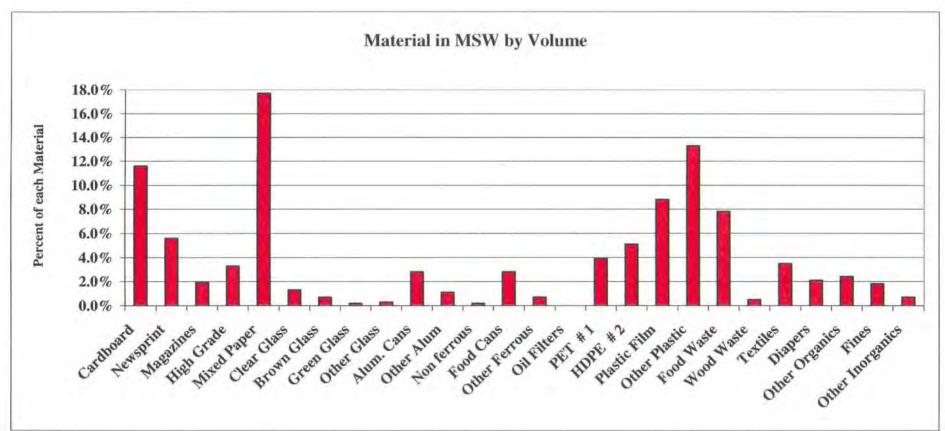
#### Municipal Solid Waste Composition by Volume



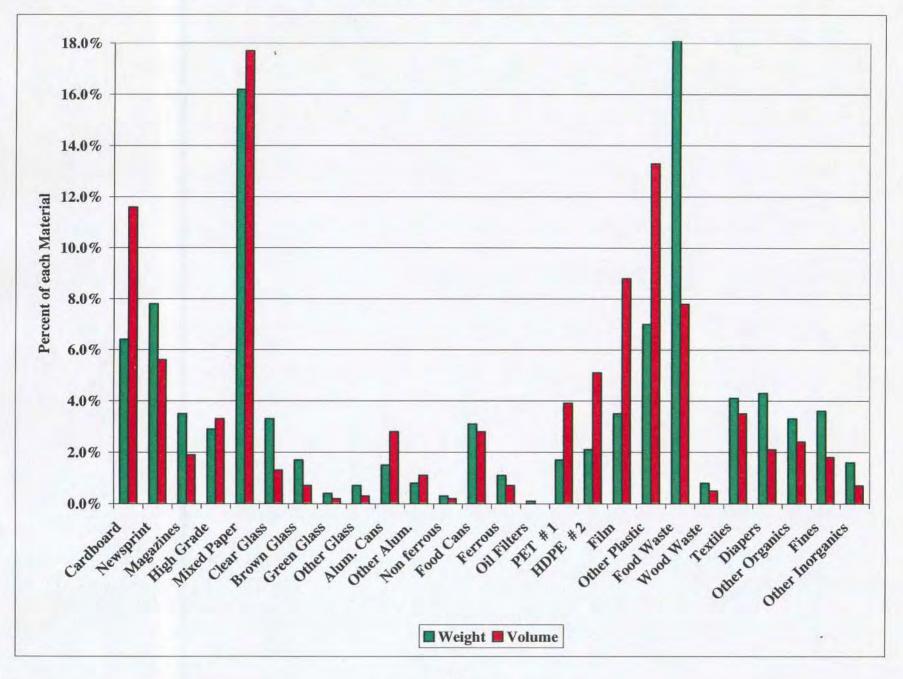








#### RELATIONSHIP BETWEEN WEIGHT AND VOLUME



#### Other Potentially Hazardous MSW Waste

One of the objectives of the *Missouri Waste Composition Study* was to measure the percentage of household hazardous wastes (HHW) in the municipal solid waste component. Household hazardous waste was not separated in the 1987 EIERA study but has been estimated at about 1% of the MSW component.

During the planning of the Missouri Waste Composition Study a category was established for Household Hazardous Waste. At the initial waste sort it became apparent that the definition of household hazardous waste was too vague to be of any significant value in the sorting process. Therefore a new category titled "other waste" was set up for any item or material which could possibly cause harm to the environment, ground water supplies, landfill liners, or solid waste handlers. The following is a list of the sub categories used to separate "other waste".

Over-the-Counter Medicine (OTC)- Medication bought over the counter. Examples: vitamins, antacid, aspirin, and cold medicine.

**Prescription Medication (Rx)-** Medication requiring a prescription. Examples: oral contraceptives, prescription inhalants, perspiration ointments, and vaccinations (human or animal).

Beauty/hygiene products- Items used for cosmetic or hygiene purposes. Examples: soap, shampoo, cosmetics, hair gel, deodorant, toothpaste, mouthwash, perfume/cologne, etc. Beauty/hygiene aerosol products- Items in an aerosol can used for hygiene purposes.

Examples: shaving cream, hair spray, deodorant.

Household cleaning products- Products used for cleaning items in a household. Examples: silver cleaner, floor wax, furniture oil, all-purpose chemical cleaners, bleach, dishwashing detergent, etc.

Household cleaning aerosol products- Products used for household cleaning in aerosol containers. Examples: furniture polish, oven cleaner, some glass cleaners, etc.

Aerosol Cans- Aerosol cans containing product. Examples: spray paint, some glues, and air fresheners.

Sharps/Blades- Items with sharp edges that could cause harm. Examples: knives, utility blades, saws.

#### Syringes and Needles

Automotive Products- Items used for car care and maintenance. Waxes, oils,

Hardware/Shop products- Items used for home improvement projects. Examples: rubber cement, caulking, wood stain, paint thinner, glue.

Gardening/Yard products- Items used for garden and lawn care and maintenance. Example: pesticides, plant food, garden chemicals, water treatment chemicals.

Pet Grooming Products- Items used to care for pets. Examples: pet medicines, shampoos. Disposable razors

#### Alkaline batteries

Miscellaneous items- Unusual items which could be harmful but do not belong in any of the above.

These items were separated and listed by sub category. The results are on the chart on page 122. The totals listed for each category are individual items and the container or package. The percentage of "other waste" in the waste component was difficult to quantify because in many cases the container weighed more than the potentially hazardous contents.

# **Potentially Hazardous Waste**

# POTENTIALLY HAZARDOUS ITEMS FOUND DURING WASTE SORTS

Solid Waste Management Districts

|                             |     |     |     |     |     | DOM |     | ender. | .,  | Be  |     |     |     |     |     |     |     |     |     |       |
|-----------------------------|-----|-----|-----|-----|-----|-----|-----|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| CATEGORY                    | A   | В   | C   | D   | E   | F   | G   | I      | J   | K   | L   | M   | N   | 0   | P   | Q   | R   | S   | T   | TOTAL |
| OTC Medicine                | 23  | 14  | 24  | 3   | 9   | 5   | 3   | 7      | 2   | 3   | 12  | 31  | 7   | 7   | 1   | 15  | 3   | 17  | 8   | 194   |
| Prescription Medication     | 37  | 1   | 1   | 8   | 8   | 8   | 8   | 19     | 2   | 13  | 10  | 12  | 10  | 6   | 10  | 18  | 31  | 41  | 3   | 246   |
| Beauty/Hygiene              | 45  | 10  | 18  | 23  | 40  | 14  | 16  | 17     | 5   | 9   | 76  | 21  | 10  | 16  | 25  | 21  | 21  | 24  | 21  | 432   |
| Beauty/Hygiene Aerosols     | 10  | 2   | 5   | 2   | 1   | 2   | 2   | 5      | 3   | 2   | 6   | 4   | 7   | 9   | 2   | 2   | 0   | 8   | 1   | 73    |
| Household Cleaning          | 5   | 3   | 1   | 3   | . 6 | 3   | 3   | 3      | 2   | 5   | 4   | 9   | 4   | 11  | 0   | 3   | 2   | 6   | 1   | 74    |
| Household Cleaning Aerosols | 2   | 2   | 1   | 7   | 1   | 1   | 0   | 0      | 1   | 0   | 6   | 1   | 5   | 4   | 0   | 2   | 0   | 2   | 2   | 37    |
| Other Aerosol Cans          | 4   | 0   | 2   | 12  | 4   | 8   | 14  | 4      | 3   | 2   | 4   | 11  | 4   | 1   | 3   | 6   | 1   | 9   | 5   | 97    |
| Automotive products         | 7   | 0   | 0   | 0   | 7   | _1  | 2   | 0      | 1   | 0   | 3   | 6   | 0   | 3   | 1   | 1   | 3   | 1   | 0   | 36    |
| Hardware/Shop Products      | 4   | 3   | 5   | 3   | 9   | - 1 | 3   | 15     | 4   | 3   | 7   | 33  | 6   | 15  | 2   | 1   | 5   | 6   | 11  | 136   |
| Gardening/Yard Products     | 1   | 2   | 0   | 0   | 4   | 2   | 1   | 3      | 1   | 0   | 2   | 1   | 2   | 7   | 0   | 0   | 3   | 3   | 2   | 34    |
| Pet Grooming Products       | 2   | 0   | 0   | 0   | 3   | 2   | 0   | 1      | 0   | 0   | 1   | 0   | 0   | 1   | 1   | 0   | 0   | 1   | 0   | 12    |
| Sharps/Blades               | 6   | 0   | 8   | 3   | 4   | 23  | - 1 | 0      | 5   | 3   | 6   | 4   | 0   | 2   | 2   | 4   | 6   | 6   | 3   | 86    |
| Syringes and Needles        | 196 | 47  | 20  | 23  | 10  | 6   | 33  | 31     | 50  | 40  | 11  | 5   | 26  | 31  | 39  | 40  | 70  | 20  | 22  | 720   |
| Disposable Razors           | 52  | 28  | 18  | 29  | 31  | 11  | 27  | 18     | 11  | 23  | 27  | 56  | 20  | 5   | 35  | 59  | 53  | 39  | 17  | 559   |
| Alkaline Batteries          | 106 | 45  | 44  | 69  | 53  | 30  | 28  | 42     | 25  | 37  | 31  | 61  | 40  | 30  | 28  | 68  | 47  | 74  | 62  | 920   |
| Miscellaneous Items         | 24  | 11  | 2   | 10  | 7   | 9   | 12  | 16     | 7   | 4   | 3   | 10  | 7   | 5   | 10  | 19  | 8   | 7   | 5   | 176   |
|                             |     |     |     |     |     |     |     |        |     |     |     |     |     |     |     |     |     |     |     | 1     |
| <b>Total Items Found</b>    | 524 | 168 | 149 | 195 | 197 | 126 | 153 | 181    | 122 | 144 | 209 | 265 | 148 | 153 | 159 | 259 | 253 | 264 | 163 | 3,832 |

# CONSTRUCTION WASTE

Construction waste is normally combined with demolition waste and described as "construction and demolition" (C&D). There are many definitions for C&D. Virtually every state has a slightly different definition for C&D waste. The EPA's Characterization of Building-Related construction and Demolition Debris in the United States (EPA530-R-98-010) contains a partial list of these varied state definitions. For the purpose of this study, C&D waste is defined as the waste resulting from new construction, remodeling, or the demolition of a structure.

However there are some differences between construction and demolition waste. Construction waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. The construction loads tended to be lighter, less weathered, more homogeneous (all wood, dry wall, etc), and contained more cardboard boxes (usually from fixtures) than the demolition waste loads. In most cases it was relatively easy to visually differentiate between the construction and demolition loads. The most difficult loads to identify were from remodeling projects. These loads contained some new material and some demolition materials. In those cases, the load was analyzed and the waste components assigned percentages. For instance a remodeling load might be estimated to be 60% construction and 40% demolition. The materials within each of these components were then estimated.

Although most loads could be easily identified visually, drivers were interviewed when possible to determine where the load originated. If a load was identified as construction waste, the percentage of each material within the load was visually estimated. Visual estimates were made during and after the load was dumped. After each load was dumped the project manager walked around the waste to identify waste materials and assign material percentages. Typically, the percentage of the predominate material was estimated first (for instance wood might be estimated at 60% of the load) and secondary materials followed, (dry wall material might be 30%, and the remaining 10% might be cardboard). Materials were estimated until 100% of the load was assigned. Obviously this was a non-scientific analysis because all data was subjective. However, materials were relatively easy to differentiate and the same person did all the estimates in order to maintain consistency. The following materials were observed and estimated as part of the construction waste component:

Wood: Waste materials that are predominately new wood from new construction.

This may include plywood, chipwood, dimensional lumber (2x4's, etc.)

shavings and sawdust.

Drywall: Gypsum wallboard that is a waste product from new construction.

Masonry: Inert materials such as brick, concrete, rock, and dirt that originated at a

construction site. This masonry material was "cleaner" and "newer" than

the demolition masonry materials.

Metal: Metallic materials that were a waste product of new construction. This

material consisted of new metal studs and metal beams and pipes

Plastic: Plastic waste materials used in new construction. This included PVC

plumbing pipe, PVC siding, Styrofoam insulation, and plastic sheet.

Cardboard: Cardboard boxes, box board, and cardboard packing material.

Other: Any waste materials originating from new construction which do not fit

into the one of the categories above. These materials include fiberglass

insulation, electrical wiring, paper, and MSW from job sites

#### The Construction Waste Component

About 5.5 percent of the solid waste in Missouri landfills is construction waste. However this percentage varies greatly from metropolitan to rural areas. The percentage of each construction waste material (wood, drywall, etc.) within each of the population groups is very similar but the amount of construction waste in large metropolitan areas is much higher than the rural areas.

The large metropolitan areas (St. Louis and Kansas City) account for about 58% of Missouri's total waste but 88% of the state's construction waste. Likewise, the rural areas account for 34% of the total waste but only 5% of the construction waste. There seems to be several reasons for this difference.

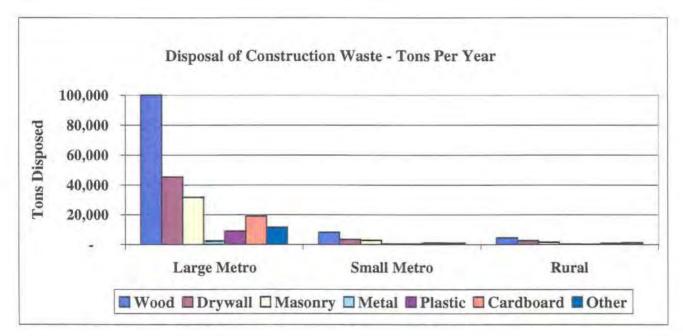
- 1. There is more construction in the metropolitan areas than the rural areas.
- The metropolitan areas have more regulations concerning waste disposal and enforcement of illegal dumping activities.
- Many rural areas allow open burning and therefore much of the carbon-based waste is burned and not disposed in landfills.
- Many urban construction contracts require proper disposal in landfills, whereas many rural
  construction contracts leave disposal options unstated.

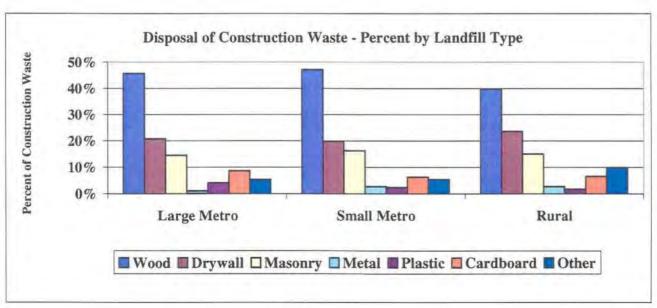
Recovery of some construction waste may be possible in the larger metropolitan areas where there are large construction waste volumes. However recovery in rural areas, where volumes are very low, seems to be impractical.

The table and charts on page 125 illustrate the composition of construction waste materials in large metropolitan, small metropolitan, and rural landfills. The construction waste for each of the observed landfills can be found in the landfill chapters.

# **Construction Waste Components**

|           | Large Metro |         | Smal | l Metro | Ru   | ral    | State Average |         |  |
|-----------|-------------|---------|------|---------|------|--------|---------------|---------|--|
| Materials | %           | Tons    | %    | Tons    | %    | Tons   | %             | Tons    |  |
| Wood      | 46%         | 100,208 | 47%  | 8,253   | 40%  | 4,447  | 45%           | 112,908 |  |
| Drywali   | 21%         | 45,467  | 20%  | 3,461   | 24%  | 2,630  | 21%           | 51,558  |  |
| Masonry   | 14%         | 31,772  | 16%  | 2,837   | 15%  | 1,681  | 15%           | 36,290  |  |
| Metal     | 1%          | 2,485   | 3%   | 476     | 3%   | 305    | 1%            | 3,266   |  |
| Plastic   | 4%          | 9,002   | 2%   | 411     | 2%   | 195    | 4%            | 9,608   |  |
| Cardboard | 9%          | 18,925  | 6%   | 1,113   | 7%   | 740    | 8%            | 20,778  |  |
| Other     | 5%          | 11,662  | 5%   | 950     | 10%  | 1,109  | 6%            | 13,721  |  |
| Total     | 100%        | 219,520 | 100% | 17,500  | 100% | 11,172 | 100%          | 248,192 |  |





# **DEMOLITION WASTE**

Demolition waste is normally combined with construction waste and described as "construction and demolition" (C&D). There are many definitions for C&D. Virtually every state has a slightly different definition for C&D waste. The EPA's *Characterization of Building-Related construction and Demolition Debris in the United States* (EPA530-R-98-010) contains a partial list of these varied state definitions. For the purpose of this study, C&D waste is defined as the waste resulting from new construction, remodeling, or the demolition of a structure.

The demolition component of C&D is quite different from the construction component. Construction waste materials tend to be more homogeneous (all new wood, or new drywall, etc.) and for the most part are easier to separate and recycle. The demolition waste materials tended to be mixed with a variety of materials, and more difficult to separate and recover.

Demolition loads fit into two broad categories; remodeling and debris.

The remodeling loads were often mixed with new construction materials. Residential remodeling loads had a higher percentage of wood while commercial remodeling projects contained more metal. Most remodeling loads arrived in open top roll-off containers or were self-hauled in pick-up or trailers.

Debris loads were essentially structures that were knocked down by heavy equipment and loaded onto dump trucks for transport to the landfill. Debris loads usually contained masonry materials (dirt, rock, concrete, and brick) that were mixed with wood, roofing, carpet, drywall and small amounts of metal. The materials were mixed and usually shredded, broken, and smashed. Therefore debris loads are much more difficult to recover materials. In many cases, a debris load consisted of dirt, rock, or masonry materials. These masonry loads were very heavy and tended to skew the overall numbers.

The following materials were observed and estimated as part of the demolition waste component:

Wood: Wood waste from the demolition or remodeling of a structure. The wood was

typically weathered, painted, and in many cases attached to some other material.

Drywall: Gypsum wallboard, which has been removed from a structure.

Roofing: Shingles that were torn off of existing roofs in anticipation of putting new

shingles on the structure. In most cases these shingles were delivered to the landfill in dump trucks or trailers and not mixed with any other materials.

Masonry: Inert materials such as brick, concrete, rock, and dirt that were removed from a

demolition site. These materials were normally mixed with other demolition

materials such as wood, drywall, etc.

Metal: Metallic items that were removed during the remodeling or demolition of a

structure.

Carpet: Carpeting that was removed and disposed of during the remodeling and or

demolition of a structure.

Other: Any other materials, not listed above, that was removed and disposed of during

the remodeling and or demolition of a structure. These included insulation, roofing insulation board, plastics, and small amounts of MSW or bulky items.

#### The Demolition Waste Component

About 13 percent of the solid waste in Missouri landfills is demolition waste. This percentage varies greatly from metropolitan areas to rural areas. As was the case in construction waste, the metropolitan demolition component is much higher than rural demolition waste.

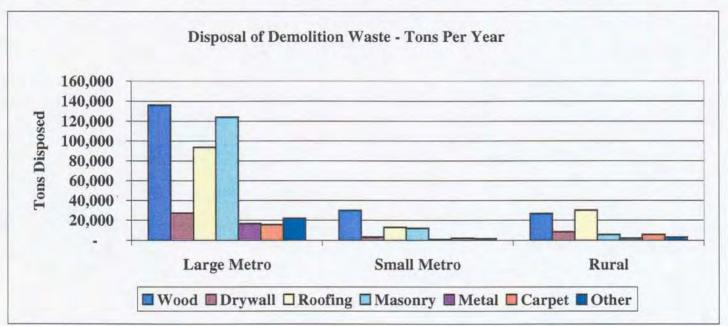
Unlike the construction waste component, the percentage of demolition waste materials (wood, dry wall, etc.) differed greatly from metropolitan areas to rural areas.

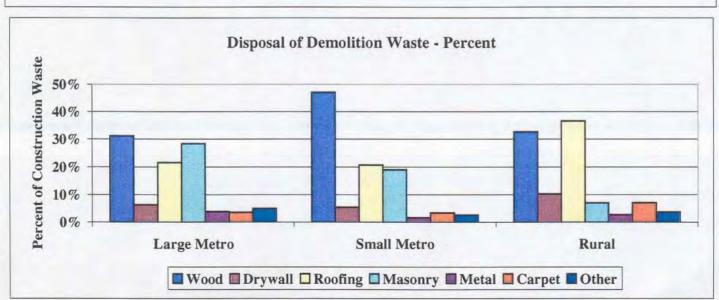
- Roofing waste was significantly higher in rural areas. The age of many structures may be older in rural areas than the metropolitan areas, thereby requiring more repairs (tear off and re-roofing).
- The percentage of masonry (dirt, rock etc.) was significantly less in rural areas. Ordinances
  and enforcement on demolition projects in rural areas may be less restrictive than
  metropolitan areas. Also, some masonry loads (dirt and rock, etc.) may be illegally disposed
  in rural areas
- 3. Wood waste was significantly higher in small metropolitan areas. During the observation period at the City of St. Joseph Landfill several trucks containing wood debris from a flood related demolition project were recorded. The unusually large amount of demolition debris received during the observation period may have inflated the amount of this material normally received by the landfill.

The table and graphs on the following page illustrate the distribution of demolition waste materials in Missouri landfills. The demolition waste for each of the observed landfills can be found in the landfill chapters.

# **Demolition Waste Component**

|           | Large Metro |         | Small | Metro  | R    | ural   | State A | verage  |
|-----------|-------------|---------|-------|--------|------|--------|---------|---------|
| Materials | %           | Tons    | %     | Tons   | %    | Tons   | %       | Tons    |
| Wood      | 31%         | 136,045 | 47%   | 29,980 | 33%  | 26,827 | 33%     | 192,852 |
| Drywall   | 6%          | 27,392  | 5%    | 3,471  | 10%  | 8,413  | 7%      | 39,276  |
| Roofing   | 22%         | 93,866  | 21%   | 13,155 | 37%  | 30,096 | 24%     | 137,117 |
| Masonry   | 28%         | 123,924 | 19%   | 12,100 | 7%   | 5,770  | 24%     | 141,794 |
| Metal     | 4%          | 16,651  | 2%    | 1,073  | 3%   | 2,265  | 3%      | 19,989  |
| Carpet    | 4%          | 15,779  | 3%    | 2,188  | 7%   | 5,843  | 4%      | 23,810  |
| Other     | 5%          | 21,961  | 3%    | 1,653  | 4%   | 3,027  | 5%      | 26,641  |
| Total     | 100%        | 436,426 | 100%  | 63,620 | 100% | 82,241 | 100%    | 582,287 |





# INDUSTRIAL WASTE

Industrial waste is difficult to define. In the broadest sense all waste from commercial operations could fall into the industrial category. The waste from a fast food restaurant is technically industrial processed waste because the waste (food scraps, paper, plastics) are all part of the manufacturing process resulting from the creation of a product. However, it is difficult to separate some of this waste from the normal municipal solid waste (MSW).

In many cases, the waste from small manufacturing, commercial, and institutional generators is collected in packer trucks. These packer trucks make hundreds of stops each day and combine the waste from each stop. In many cases the same truck that picks up residential waste will also pick up commercial and institutional waste. In fact, these small waste commercial generators were included in the waste sorts of MSW conducted in 1996-97.

For the purpose of this study industrial waste is defined as follows:

- · Waste from an industrial, manufacturing, or commercial operation
- · Waste that was visibly homogeneous (all the same type of material)
- Waste from a single waste generator and not combined with other generators

In most cases the industrial waste was delivered to the landfill in open top roll-off containers, roll-off compactor units, dump trucks, or oversized trailers. The materials within these vehicles and/or containers was a result of a manufacturing or industrial process. In many cases the waste materials were wooden pallets, crating material, strapping, or cardboard. These materials were not a direct waste product of the manufacturing process, but they were an indirect waste product of the manufacturer.

The following materials were observed and estimated as part of the industrial waste component:

Cardboard: Corrugated containers. Whole, flattened, shredded, or baled.

Paper: Paper materials included wrapping waste, overruns from printing, and office paper

from a single waste generator.

Food: Human or animal food wastes resulting from processing or overruns.

Metall: Metallic waste material from a single waste generator. Does not include metal

sludges, which were categorized as "other".

Wood: Includes wooden palates, crating, waste from wood processing and sawdust.

Plastics: All plastic resin waste including, processed waste, packing materials, and plastic

resin sludges.

Textiles: Includes clothing, rags, and processed cloth waste.

Rubber: Includes auto and truck tires from tire shredders, and

processed rubber waste materials and overruns.

Other: All industrial processed wastes that were not included above. The great majority

of this category was waste products from metal processing plants. This included

foundry sand, aluminum ore waste products, and carbon black.

#### The Industrial Waste Component

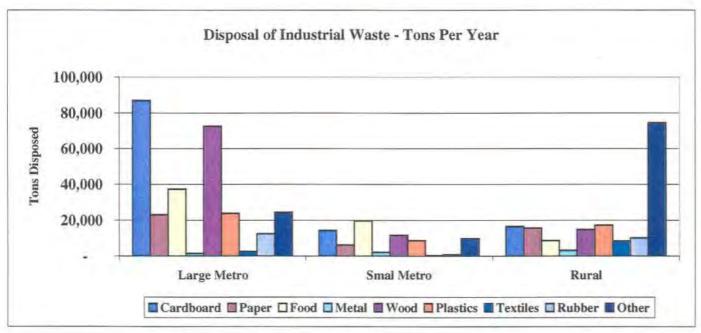
About 12 percent of the solid waste in Missouri landfills is industrial waste (as it is described above). The industrial waste component varied greatly from one landfill to another. Food wastes were considerably higher in the western portion of the state (Kansas City and St. Joseph). Large amounts of aluminum ore were received at the Lemons landfill in Dexter. Large amounts of rubber waste were received at the Peerless and Fred Weber landfills (from the Tire Shredders) and Butler County (from the Gates Rubber plant). Oak Ridge and Lamar received large amounts of foundry sand from local foundries.

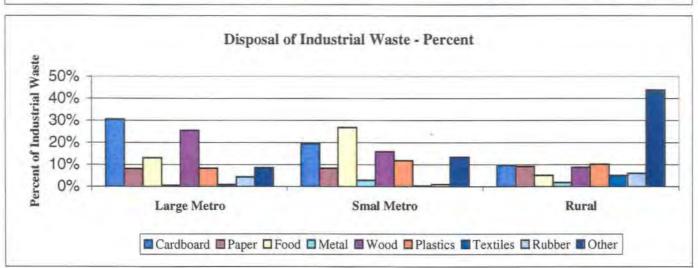
Cardboard (in the form of boxes) and wood (in the form of pallets, crates and sawdust from wood processing plants) accounted for more than 50% of the large metropolitan industrial waste. Food waste was the most prevalent industrial material in the small metropolitan landfills. Waste products from metal processing plants (aluminum smelting by products, foundry sand, and carbon black) accounted for almost half of the rural industrial waste component.

The table and graphs on the following page illustrate the distribution of industrial waste materials in Missouri landfills. The industrial waste for each of the observed landfills can be found in the landfill chapters.

# **Industrial Waste Component**

|           | Large Metro |         | Smal | l Metro | R    | lural   | State A | verage  |
|-----------|-------------|---------|------|---------|------|---------|---------|---------|
| Materials | %           | Tons    | %    | Tons    | %    | Tons    | %       | Tons    |
| Cardboard | 31%         | 87,000  | 20%  | 14,397  | 10%  | 16,662  | 22%     | 118,059 |
| Paper     | 8%          | 23,025  | 8%   | 6,149   | 9%   | 15,761  | 9%      | 44,935  |
| Food      | 13%         | 37,333  | 27%  | 19,698  | 5%   | 8,691   | 12%     | 65,722  |
| Metal     | 0%          | 1,414   | 3%   | 2,110   | 2%   | 3,216   | 1%      | 6,740   |
| Wood      | 26%         | 72,612  | 16%  | 11,741  | 9%   | 14,960  | 19%     | 99,313  |
| Plastics  | 8%          | 23,926  | 12%  | 8,703   | 10%  | 17,363  | 9%      | 49,992  |
| Textiles  | 1%          | 2,496   | 0%   | 253     | 5%   | 8,516   | 2%      | 11,265  |
| Rubber    | 4%          | 12,507  | 1%   | 752     | 6%   | 10,261  | 4%      | 23,520  |
| Other     | 9%          | 24,438  | 13%  | 9,844   | 44%  | 74,629  | 21%     | 108,911 |
| Total     | 100%        | 284,752 | 100% | 73,546  | 100% | 170,060 | 100%    | 528,358 |





# OTHER WASTE

The "Other" category includes all the materials that do not fit neatly into one of the previously discussed waste components. This is a category that is often overlooked by solid waste management planners but represents a very significant portion of the waste stream.

The following materials were observed and estimated as part of the "other" waste component:

Bulky items: Includes furniture, mattresses, box springs, bicycles, large appliances, and any

other household item that will not fit into a normal size trash bag.

Soil: Includes contaminated and non-contaminated soil. This soil was unloaded in a

separate area of the landfill and normally used for daily cover. If the soil was unloaded on the face and mixed immediately it was classified as demolition

masonry.

Asbestos: Insulation made with asbestos fibers and declared to be special waste. This item

was handled with special care at the landfill. In most cases the asbestos loads were estimated by volume and therefore a 3:1 ratio was used to convert volumes

to weight.

Other: This category included everything that did not fit into any of the components and

material categories mentioned previously. Materials included municipal sewage sludge, unidentifiable sludge, commercial yard waste and stumps, and all other

unidentifiable materials.

#### The "Other" Waste Component

The other waste component was the most surprising part of the study. Most solid waste planners understand the importance of MSW, C&D, and industrial waste. However, during observation periods over 10% of the total solid waste received at landfills fell into the "other" category. By far the highest percentage material was soil (69%).

We don't normally think of soil as solid waste but it was received as waste, reported to DNR as waste, and put into the landfill as waste. There were two main categories of soil.

Contaminated soil came from remediation projects (soil around underground tanks, soil from a hazardous spill area, etc.). The contaminated soil was normally set off to the side of the working face and allowed to "air out" for a period of time. At some later time this materials was used for daily cover.

Clean soil was also delivered to the landfill and listed as solid waste. Some landfills gave special rates to contractors that brought clean soil to the landfill because it saved the landfill the expense of hauling daily cover. However at each of the observed landfills, this clean soil, used for daily cover, was reported as solid waste and the surcharge paid to DNR.

About 13% of the Other waste component were bulky items. These were normally furniture, mattresses, and other large items that could not be neatly put into a trash bag for pick up. Clean-up contractors or individuals hauling their own bulky items in a pick-up or trailer brought many of the bulky items to the landfill. Many rural communities have a "clean-up" week and the amount of bulky material received was higher during these times. The City of Kansas City has two trucks with grapple arms that pick up bulky items in the Kansas City area year round.

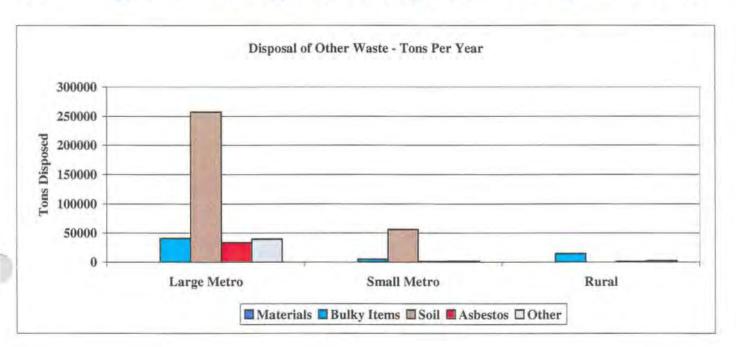
Asbestos was recorded at 0.8% but that figure is misleading. Asbestos is charged for by the cubic yard. Therefore if a 40-yard closed container is hauled with asbestos, the landfill charges for 40 yards. The universal conversion rate is 3:1 (3 cubic yards equal 1 ton). However asbestos is normally light and therefore those conversion rates tend to inflate the actual figures.

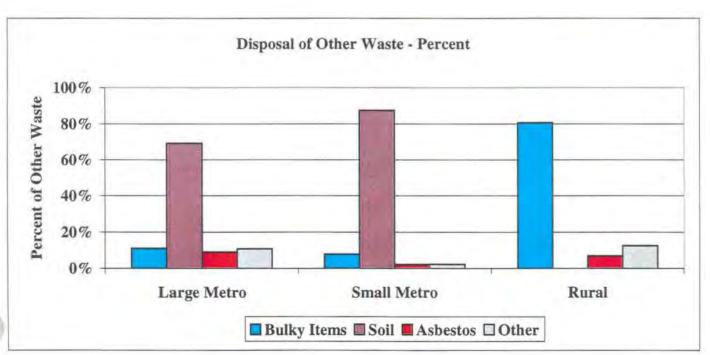
The remainder of the Other waste component was sewage sludge, commercial yard waste, stumps, and organic materials from non-industrial processes. The sewage sludge was very heavy and most loads weighed over 15 tons.

The table and graphs on the following page illustrate the distribution of other waste materials in Missouri landfills. The other waste for each of the observed landfills can be found in the landfill chapters.

# The Other Waste Component

|             | Large Metro |         | Sma  | Small Metro |      | ıral   | State A | verage  |
|-------------|-------------|---------|------|-------------|------|--------|---------|---------|
| Materials   | % 1         | Tons    | %    | Tons        | %    | Tons   | %       | Tons    |
| Bulky Items | 11%         | 41,096  | 8%   | 5,071       | 81%  | 14,616 | 13%     | 60,783  |
| Soil        | 69%         | 257,316 | 88%  | 56,290      | 0%   | 10.45  | 69%     | 313,606 |
| Asbestos    | 9%          | 33,826  | 2%   | 1,369       | 7%   | 1,250  | 8%      | 36,445  |
| Other       | 11%         | 40,038  | 2%   | 1,490       | 13%  | 2,270  | 10%     | 43,798  |
| Total       | 100%        | 372,276 | 100% | 64,321      | 100% | 18,136 | 100%    | 454,733 |





# GEOGRAPHICAL VARIATIONS IN SOLID WASTE DISPOSAL

The population densities of Missouri fall into three main categories. According to the Missouri State Census Data Center, Missouri is comprised of two large metropolitan areas, three small metropolitan areas, and the remainder is classified as rural. The composition and quantity of waste received by a landfill is greatly affected by the density of the population it serves.

Metropolitan areas have more regulations associated with waste management than their rural counterparts. For example; most metropolitan areas have bans on burning MSW but many rural areas do not, most industries locate in a metropolitan area to take advantage of labor forces and efficient transportation networks, and construction and demolition waste is more prevalent in metropolitan areas. Therefore the composition of solid waste varied significantly between metropolitan and rural landfills.

The following three sections of this report characterize the solid waste components of the large metropolitan, small metropolitan, and rural areas of the state. All observations were done between October 1998 and May of 1999. The estimated tonnage for each material and component is based on actual tonnage reported to the Missouri Department of Natural Resources.

All percentages are based on observations and extrapolations as explained in the introduction. The percentage of waste components and their materials were multiplied by the actual tonnage reported to Missouri DNR. Those tonnage totals were then combined with other geographically similar landfills to produce a profile of each type of landfill (large metropolitan, small metropolitan, and rural).

# LARGE METROPOLITAN AREAS

Over half of Missouri's population resides within the states two large metropolitan areas. According to the Missouri State Census Data, the population of the St. Louis metropolitan area is 2,444,099, and the population of the Kansas City Metropolitan area is 1,566,280. However there are major difference between the waste flows from each area. Both metropolitan areas export waste to neighboring states.

#### St. Louis

The five St. Louis landfills (three sanitary and two C&D) received 1,767,353 tons of waste in 1998. The Oak Ridge Landfill in West St. Louis County is owned by Superior Waste Services. The Bridgeton Landfill in Bridgeton is owned by Allied Waste Services. The Fred Weber Inc. Landfill in Maryland Heights is owned and operated by Fred Weber Inc. The Peerless C&D landfill is located in West St. Louis County, and the Rockhill C&D landfill is located in an old quarry in Rockhill.

In addition, the St. Louis area exports a considerable amount of waste to Illinois. The City of St. Louis South Transfer station exported about 280,000 tons, the Waste Management Inc. transfer stations exported over 66,000 plus individual packer loads, and Republic exported about 30,000 tons to Illinois in 1998. The State of Illinois reported receiving 1,154,657 tons of waste from Missouri.

In addition to the export situation, the ownership of private hauling companies and landfills seem to change almost weekly. The largest national companies in the solid waste industry are vertically integrated. It makes good business sense to own the hauling division, transfer station, transportation companies and of course the final destination for most solid waste, the landfill.

The table on page 142 lists the composition of the three St. Louis landfills and the table on page 143 combines the sanitary and C&D waste for the five St. Louis landfills (3 sanitary and 2 C&D).

The Chart on page 145 illustrates the waste distribution and composition of St. Louis solid waste. The bar graph at the bottom of page 145 illustrates the tonnage for all materials regardless of their origins. The materials are combined into the following categories.

Paper: Includes MSW, construction cardboard, industrial cardboard and paper.

Glass: MSW only

Metals: Includes metals from MSW, construction, demolition, and industrial.

Plastics: Includes MSW, construction, and industrial.

Organics: Includes MSW, industrial food, textiles, and rubber.

Inorganics: Includes MSW, construction and demolition drywall, construction and demolition

masonry, and soil

Wood: Includes construction, demolition, and industrial wood.

Roofing: Demolition roofing only

Other Items: Includes "other" items from each component plus demolition carpet and asbestos.

Bulky Items: Includes furniture and other materials too large to be disposed in bags.

# ST. LOUIS SANITARY LANDFILL COMPONENTS

| MATERIAL                 | Oak Ri | dge  | Fred V    | Veber                                   | Bridge | eton      | Total S | St. Louis |
|--------------------------|--------|--|-----------|---|--------|-----------|---------|-----------|
| ,                        | Pct.   | Estimated  | Pct.      | Estimated                               | Pct.   | Estimated | Pct.    | Estimated |
| Municipal Solid Waste    |        | Tonnage*   |           | Tonnage*                                |        | Tonnage*  |         | Tonnage*  |
| Paper                    | 20.5%  | 53,778   | 11.6%     | 37,411                                  | 24.9%  | 227,412   | 21.3%   | 318,601   |
| Glass                    | 3.2%   | 8,359  | 1.8%      | 5,812                                   | 3.9%   | 35,369    | 3.3%    | 49,540    |
| Metals                   | 3.8%   | 9,937  | 2.1%      | 6,869                                   | 4.6%   | 42,025    | 3.9%    | 58,831    |
| Plastics                 | 7.9%   | 20,769   | 4.5%      | 14,478                                  | 9.6%   | 87,825    | 8.2%    | 123,073   |
| Organics                 | 16.9%  | 44,438   | 9.6%      | T 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 20.6%  | 187,771   | 17.6%   | 263,068   |
| Inorganics               | 2.6%   | 6,909  | 1.5%      | 4,756                                   | 3.2%   | 29,308    | 2.7%    | 40,973    |
| TOTAL MSW                | 55.0%  | 144,190  | 31.2%     | 100,185                                 | 66.7%  | 609,710   | 57.0%   | 854,085   |
| Construction Waste       |        |  |           |   |        |           |         | -         |
| Wood                     | 2.1%   | 5,587  | 7.6%      | 24,518                                  | 2.1%   | 19,274    | 3.3%    | 49,379    |
| Dry Wall                 | 1.3%   | 3,390  | 4.1%      | 13,210                                  | 0.8%   | 7,153     | 1.6%    | 23,754    |
| Masonry                  | 1.8%   | 4,649  | 1.3%      | 4,333                                   | 0.8%   | 7,551     | 1.1%    | 16,532    |
| Metal                    | 0.0%   | 128  | 0.2%      | 634                                     | 0.0%   | 99        | 0.1%    | 861       |
| Plastic                  | 0.1%   | 367  | 0.6%      | 1,797                                   | 0.2%   | 2,086     | 0.3%    | 4,250     |
| Cardboard                | 0.2%   | 567  | 1.4%      | 4,544                                   | 0.5%   | 4,471     | 0.6%    | 9,582     |
| Other                    | 0.2%   | 580  | 0.7%      | 2,325                                   | 0.1%   | 695       | 0.2%    | 3,600     |
| TOTAL CONSTRUCTION       | 5.8%   | 15,268   | 16.0%     | 51,361                                  | 4.5%   | 41,330    | 7.2%    | 107,958   |
| Demolition Waste         |        |  |           |   |        | 3.1       |         | -         |
| Wood                     | 2.1%   | 5,629  | 8.9%      | 28,745                                  | 2.1%   | 18,777    | 3.5%    | 53,152    |
| Dry Wall                 | 0.1%   | 337  | 1.8%      | 5,812                                   | 0.8%   | 6,855     | 0.9%    | 13,004    |
| Roofing                  | 0.6%   | 1,608  | 8.1%      | 25,892                                  | 0.6%   | 5,266     | 2.2%    | 32,765    |
| Masonry                  | 2.1%   | 5,629  | 10.0%     | 32,021                                  | 1.9%   | 17,784    | 3.7%    | 55,434    |
| Metal                    | 0.3%   | 798  | 1.8%      | 5,812                                   | 0.3%   | 2,285     | 0.6%    | 8,895     |
| Carpet                   | 0.4%   | 972  | 1.3%      | 4,227                                   | 0.5%   | 4,173     | 0.6%    | 9,372     |
| Other                    | 0.2%   | 571  | 2.5%      | 8,137                                   | 0.1%   | 993       | 0.6%    | 9,702     |
| TOTAL DEMOLITION         | 5.9%   | 15,545   | 34.4%     | 110,648                                 | 6.1%   | 56,133    | 12.2%   | 182,325   |
| Industrial Waste         |        |  |           | 4.5                                     |        |           | 0.00/   | -         |
| Cardboard                | 1.4%   | 3,761  | 1.9%      | 6,129                                   | 4.8%   | 43,416    | 3.6%    | 53,307    |
| Paper                    | 1.2%   | 3,190  | 0.7%      | 2,114                                   | 0.7%   | 6,557     | 0.8%    | 11,861    |
| Food                     | 0.5%   | 1,395  | 0.0%      | 122                                     | 0.0%   | -         | 0.1%    | 1,395     |
| Metal                    | 0.1%   | 247  | 0.0%      | 106                                     | 0.0%   | 99        | 0.0%    | 452       |
| Wood                     | 0.7%   | 1,753  | 0.9%      | 2,959                                   | 4.0%   | 36,263    | 2.7%    | 40,975    |
| Plastic                  | 1.1%   | 2,981  | 0.5%      | 1,691                                   | 0.9%   | 8,643     | 0.9%    | 13,315    |
| Textiles                 | 0.0%   |  | 0.1%      | 211                                     | 0.3%   | 2,285     | 0.2%    | 2,496     |
| Rubber                   | 0.1%   | 158  | 2.7%      | 8,560                                   | 0.0%   | 199       | 0.6%    | 8,917     |
| Other                    | 3.2%   | 8,487  | 0.0%      | 04 770                                  | 0.4%   | 4,073     | 0.8%    | 12,560    |
| TOTAL INDUSTRIAL         | 8.4%   | 21,972   | 6.8%      | 21,770                                  | 11.1%  | 101,536   | 9.7%    | 145,278   |
| Special Wastes           |        | STATE OF THE PARTY | TO SECOND |   |        |           |         |           |
| Bulky Items              | 0.5%   | 1,335  | 4.2%      | 13,527                                  | 0.7%   | 6,160     | 1.4%    | 21,022    |
| Soil and Inert Materials | 24.4%  | 64,056   | 0.0%      |   | 8.0%   | 73,320    | 9.2%    | 137,376   |
| Asbestos                 | 0.0%   |  | 0.0%      | - 7                                     | 1.2%   | 10,829    | 0.7%    | 10,829    |
| Other                    | 0.0%   | . 1  | 7.4%      | 23,778                                  | 1.6%   | 14,604    | 2.6%    | 38,383    |
| TOTAL SPECIAL            | 24.9%  | 65,391   | 11.6%     | 37,305                                  | 11.5%  | 104,913   | 13.9%   | 207,609   |
| TOTAL WASTE STREAM       | 100%   | 262,365  | 100%      | 321,269                                 | 100%   | 913,621   | 100%    | 1,497,255 |

<sup>\*</sup> Based on observation data

# TOTAL ST. LOUIS LANDFILL COMPONENTS

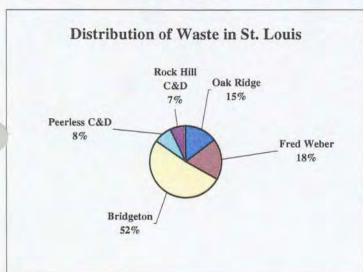
| MATERIAL                 | Pee   | erless    | Roc   | khill     | Other | Landfills*       | * Tota     | St. Louis |
|--------------------------|-------|-----------|-------|-----------|-------|------------------|------------|-----------|
|                          | Pct.  | Estimated | Pct.  | Estimated | Pct.  | Estimated        | Pct.       | Estimated |
| Municipal Solid Waste    |       | Tonnage*  |       | Tonnage*  |       | Tonnage*         | Brand over | Tonnage** |
| Paper                    | 0.0%  |           | 0.0%  |           | 21.3% |                  | 18.0%      |           |
| Glass                    | 0.0%  |           | 0.0%  |           | 3.3%  |                  | 2.8%       |           |
| Metals                   | 0.0%  |           | 0.0%  |           | 3.9%  | Charles Branches | 3.3%       |           |
| Plastics                 | 0.0%  |           | 0.0%  |           | 8.2%  |                  | 7.0%       |           |
| Organics                 | 0.0%  | -         | 0.0%  |           | 17.6% |                  | 14.9%      |           |
| Inorganics               | 0.0%  | - 1       | 0.0%  |           | 2.7%  | 40,973           | 2.3%       | 40,973    |
| TOTAL MSW                | 0.0%  |           | 0.0%  | *         | 57.0% | 854,085          | 48.3%      | 854,085   |
| Construction Waste       |       |           |       |           |       |                  |            |           |
| Wood                     | 15.0% | 21,977    | 4.8%  | 5,984     | 3.3%  | 49,379           | 4.4%       | 77,341    |
| Dry Wall                 | 7.3%  | 10,742    | 2.2%  | 2,773     | 1.6%  | 23,754           | 2.1%       | 37,269    |
| Masonry                  | 5.3%  | 7,728     | 0.4%  | 511       | 1.1%  | 16,532           | 1.4%       | 24,770    |
| Metal                    | 0.2%  | 301       | 0.0%  | 4         | 0.1%  | 861              | 0.1%       | 1,162     |
| Plastic                  | 1.3%  | 1,973     | 0.4%  | 438       | 0.3%  | 4,250            | 0.4%       | 6,661     |
| Cardboard                | 3.3%  | 4,823     | 1.1%  | 1,387     | 0.6%  | 9,582            | 0.9%       | 15,792    |
| Other                    | 4.8%  | 7,015     | 0.5%  | 657       | 0.2%  | 3,600            | 0.6%       | 11,272    |
| TOTAL CONSTRUCTION       | 37.3% | 54,559    | 9.5%  | 11,750    | 7.2%  | 107,958          | 9.9%       | 174,267   |
| Demolition Waste         |       |           |       |           |       |                  |            |           |
| Wood                     | 13.5% | 19,703    | 24.3% | 30,141    | 3.5%  | 53,152           | 5.8%       | 102,996   |
| Dry Wall                 | 3.4%  | 4,933     | 1.4%  | 1,679     | 0.9%  | 13,004           | 1.1%       | 19,615    |
| Roofing                  | 18.7% | 27,375    | 8.1%  | 9,998     | 2.2%  | 32,765           | 4.0%       | 70,139    |
| Masonry                  | 12.1% | 17,675    | 25.0% | 30,944    | 3.7%  | 55,434           | 5.9%       | 104,053   |
| Metal                    | 1.2%  | 1,781     | 1.8%  | 2,189     | 0.6%  | 8,895            | 0.7%       | 12,866    |
| Carpet                   | 1.6%  | 2,411     | 0.4%  | 511       | 0.6%  | 9,372            | 0.7%       | 12,294    |
| Other                    | 6.1%  | 8,961     | 0.1%  | 146       | 0.6%  | 9,702            | 1.1%       | 18,809    |
| TOTAL DEMOLITION         | 56.6% | 82,839    | 61.0% | 75,608    | 12.2% | 182,325          | 19.3%      | 340,772   |
| Industrial Waste         |       |           |       |           |       |                  |            |           |
| Cardboard                | 0.3%  | 438       | 0.0%  |           | 3.6%  | 53,307           | 3.0%       | 53,745    |
| Paper                    | 0.5%  | 685       | 0.0%  | -         | 0.8%  | 11,861           | 0.7%       | 12,546    |
| Food                     | 0.0%  |           | 0.0%  |           | 0.1%  | 1,395            | 0.1%       | 1,395     |
| Metal                    | 0.3%  | 493       | 0.0%  |           | 0.0%  | 452              | 0.1%       | 945       |
| Wood                     | 1.1%  | 1,562     | 0.0%  | - 0       | 2.7%  | 40,975           | 2.4%       | 42,537    |
| Plastic                  | 0.8%  | 1,233     | 0.0%  | - 15      | 0.9%  | 13,315           | 0.8%       | 14,548    |
| Textiles                 | 0.0%  | -         | 0.0%  | · 8       | 0.2%  | 2,496            | 0.1%       | 2,496     |
| Rubber                   | 2.5%  | 3,590     | 0.0%  | . 1       | 0.6%  | 8,917            | 0.7%       | 12,507    |
| Other                    | 0.6%  | 849       | 0.0%  | 1.41      | 0.8%  | 12,560           | 0.8%       | 13,409    |
| TOTAL INDUSTRIAL         | 6.1%  | 8,851     | 0.0%  | - 4       | 9.7%  | 145,278          | 8.7%       | 154,129   |
| Special Wastes           |       |           |       |           |       |                  |            |           |
| Bulky Items              | 0.0%  | - 2       | 0.0%  | - 1       | 1.4%  | 21,022           | 1.2%       | 21,022    |
| Soil and Inert Materials | 0.0%  | - 1       | 29.5% | 36,491    | 9.2%  | 137,376          | 9.8%       | 173,867   |
| Asbestos                 | 0.0%  | .         | 0.0%  | -         | 0.7%  | 10,829           | 0.6%       | 10,829    |
| Other                    | 0.0%  | . =       | 0.0%  | - 1       | 2.6%  | 38,383           | 2.2%       | 38,383    |
| TOTAL SPECIAL            | 0.0%  | - 6       | 29.5% | 36,491    | 13.9% | 207,609          | 13.8%      | 244,100   |
| TOTAL WASTE STREAM       | 100%  | 146,249   | 100%  | 123,849   | 100%  | 1,497,255        | 100%       | 1,767,353 |

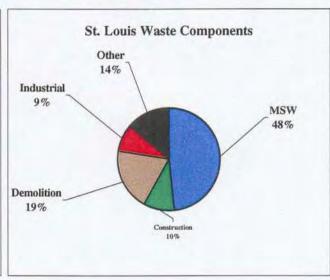
<sup>\*</sup> Based on observation data

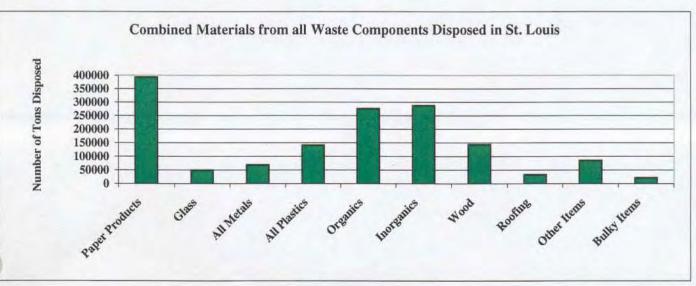
<sup>\*\*</sup> Includes observed data from Oak Ridge, Bridgeton, and Fred Weber landfill's

### ST. LOUIS LANDFILL COMPONENTS









#### Kansas City

Prior to March 1999 there were three Missouri landfills in the greater Kansas City area. The Courtney Ridge Landfill in Sugar Creek, Missouri is owned and operated by Waste Management Inc. All MSW from the City of Kansas City is picked up in City refuse trucks and taken to the Courtney Ridge Facility. There are also several industrial parks near the landfill. The Courtney Ridge Landfill was observed in February of 1999 and results are on page 39.

Allied Waste Services owned and operated the Southeast Landfill in Kansas City until it closed in March of 1999. They received MSW from independent haulers, BFI, and Deffenbaugh. Due to their location near the older portion of the metropolitan area, they received higher quantities of demolition materials. During the observation period they received sizable amounts of contaminated soil from underground tank remediation projects and the City of Kansas City Street Department. The Southeast Landfill was observed in December of 1998 and the results are on page 87.

The City of Lee's Summit also owns and operates a landfill. However the City of Lee's Summit does not operate a municipal waste hauling service. The individual waste hauler contracts all residential and commercial hauling. The Lee's Summit Landfill was observed in May 1999 but an error in the scale software program made the scale data unreliable. Therefore the data from that observation period was not used. A weighted average of the Courtney Ridge and Southeast landfills was used to estimate the waste components at Lee's Summit.

Some of the Kansas City waste is exported to Kansas. The State of Kansas reports that 395,712 tons of waste was received from Missouri in 1995. However that figure is somewhat misleading. The state line runs directly through the greater Kansas City Metropolitan area and many waste loads (both packers and self-haul) are picked up in Missouri and driven to a nearby Kansas landfill. The State of Kansas does not track these individual trucks (their import numbers primarily reflect transfer trailers arriving from out of state).

The table on page 148 lists the composition of the three Kansas City landfills.

The Chart on page 149 illustrates the waste distribution and composition for Kansas City solid waste. The bar graph at the bottom of page 149 illustrates the tonnage for all materials regardless of their origins. The materials are combined into the following categories.

Paper: Includes MSW, construction cardboard, industrial cardboard and paper.

Glass: MSW only

Metals: Includes metals from MSW, construction, demolition, and industrial.

Plastics: Includes MSW, construction, and industrial.

Organics: Includes MSW, industrial food, textiles, and rubber.

Inorganics: Includes MSW, construction and demolition drywall, construction and demolition

masonry, and soil

Wood: Includes construction, demolition, and industrial wood.

Roofing: Demolition roofing only

Other Items: Includes "other" items from each component plus demolition carpet and asbestos.

Bulky Items: Includes furniture and other materials too large to be disposed in bags.

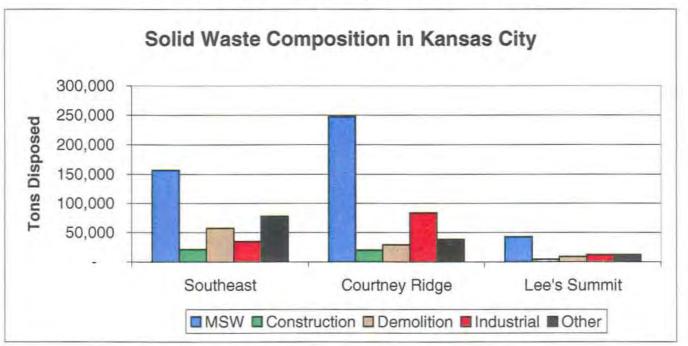
# KANSAS CITY SOLID WASTE COMPONENTS

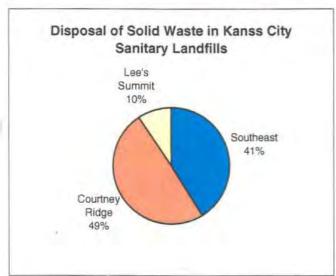
| MATERIAL                 | South | east      | Court | ney Ridge | Lee's | Summit    | Total Kan | sas City  |
|--------------------------|-------|-----------|-------|-----------|-------|-----------|-----------|-----------|
|                          | Pct.  | Estimated | Pct.  | Estimated | Pct.  | Estimated | Pct.      | Estimated |
| Municipal Solid Waste    |       | Tonnage*  |       | Tonnage*  |       | Tonnage** |           | Tonnage   |
| Paper                    | 16.8% | 58,515    | 21.6% | 90,357    | 19.4% | 15,652    | 19.4%     | 164,524   |
| Glass                    | 2.6%  | 9,092     | 3.4%  | 14,338    | 3.1%  | 2,501     | 3.1%      | 25,931    |
| Metals                   | 3.1%  | 10,802    | 4.1%  | 17,032    | 3.6%  | 2,905     | 3.6%      | 30,738    |
| Plastics                 | 6.5%  | 200       | 8.5%  | 35,604    | 7.6%  | 6,132     | 7.6%      | 64,349    |
| Organics                 | 13.9% |           | 18.2% | 76,212    | 16.2% | 13,070    | 16.2%     | 137,617   |
| Inorganics               | 2.2%  | 7,538     | 2.8%  | 11,836    | 2.5%  | 2,017     | 2.5%      | 21,391    |
| TOTAL MSW                | 45.1% | 156,894   | 59.1% | 247,399   | 52.7% | 42,519    | 52.7%     | 446,813   |
| Construction Waste       |       |           |       |           |       |           |           |           |
| Wood                     | 2.9%  | 10,102    | 2.5%  | 10,344    | 2.7%  | 2,178     | 2.7%      | 22,625    |
| Dry Wall                 | 0.9%  | 3,147     | 1.0%  | 4,244     | 1.0%  | 807       | 1.0%      | 8,198     |
| Masonry                  | 1.4%  | 4,896     | 0.3%  | 1,299     | 0.8%  | 645       | 0.8%      | 6,840     |
| Metal                    | 0.3%  | 909       | 0.1%  | 414       | 0.2%  | 161       | 0.2%      | 1,484     |
| Plastic                  | 0.2%  | 715       | 0.4%  | 1,626     | 0.3%  | 242       | 0.3%      | 2,583     |
| Cardboard                | 0.3%  | 1,065     | 0.5%  | 2,069     | 0.4%  | 323       | 0.4%      | 3,456     |
| Other                    | 0.1%  | 303       | 0.0%  | 87        | 0.1%  | 81        | 0.1%      | 470       |
| TOTAL CONSTRUCTION       | 6.1%  | 21,137    | 4.8%  | 20,083    | 5.4%  | 4,357     | 5.4%      | 45,576    |
| Demolition Waste         |       |           |       |           |       |           |           |           |
| Wood                     | 5.6%  | 19,660    | 2.4%  | 10,162    | 3.9%  | 3,147     | 3.9%      | 32,968    |
| Dry Wall                 | 1.2%  | 4,305     | 0.6%  | 2,665     | 0.9%  | 726       | 0.9%      | 7,697     |
| Roofing                  | 4.2%  | 14,609    | 1.6%  | 6,697     | 2.8%  | 2,259     | 2.8%      | 23,566    |
| Masonry                  | 4.5%  | 15,775    | 0.6%  | 2,483     | 2.4%  | 1,936     | 2.4%      | 20,194    |
| Metal                    | 0.3%  | 1,197     | 0.6%  | 2,589     | 0.5%  | 403       | 0.5%      | 4,189     |
| Carpet                   | 0.3%  | 1,204     | 0.5%  | 2,281     | 0.5%  | 403       | 0.5%      | 3,888     |
| Other                    | 0.2%  | 824       | 0.6%  | 2,329     | 0.4%  | 323       | 0.4%      | 3,475     |
| TOTAL DEMOLITION         | 16.5% | 57,574    | 7.0%  | 29,205    | 11.3% | 9,117     | 11.3%     | 95,896    |
| Industrial Waste         |       |           |       |           |       |           |           |           |
| Cardboard                | 3.4%  | 11,889    | 4.3%  | 18,139    | 3.9%  | 3,147     | 3.9%      | 33,175    |
| Paper                    | 0.8%  | 2,860     | 1.6%  | 6,813     | 1.3%  | 1,049     | 1.3%      | 10,721    |
| Food                     | 1.1%  | 3,862     | 6.9%  | 28,849    | 4.3%  | 3,469     | 4.3%      | 36,180    |
| Metal                    | 0.1%  | 295       | 0.0%  | 173       | 0.1%  | 81        | 0.1%      | 549       |
| Wood                     | 2.4%  | 8,315     | 4.4%  | 18,533    | 3.5%  | 2,824     | 3.5%      | 29,672    |
| Plastic                  | 1.3%  | 4,616     | 0.9%  | 3,955     | 1.1%  | 888       | 1.1%      | 9,458     |
| Textiles                 | 0.0%  | - 1       | 0.0%  |           | 0.0%  | -         | 0.0%      | 100       |
| Rubber                   | 0.0%  |           | 0.0%  |           | 0.0%  |           | 0.0%      |           |
| Other                    | 0.8%  | 2,937     | 1.7%  | 7,284     | 1.3%  | 1,049     | 1.3%      | 11,271    |
| TOTAL INDUSTRIAL         | 10.0% | 34,775    | 20.0% | 83,746    | 15.5% | 12,506    | 15.5%     | 131,027   |
| Special Wastes           |       |           | 2 247 |           |       |           | 2.02      | 44.444    |
| Bulky Items              | 1.5%  | 5,113     | 3.2%  | 13,347    | 2.4%  | 1,936     | 2.4%      | 20,396    |
| Soil and Inert Materials | 19.1% | 66,441    | 2.1%  | 8,939     | 9.8%  | 7,907     | 9.8%      | 83,287    |
| Asbestos                 | 1.8%  | 6,326     | 3.4%  | 14,251    | 2.7%  | 2,178     | 2.7%      | 22,755    |
| Other                    | 0.0%  | - 2       | 0.4%  | 1,655     | 0.2%  | 161       | 0.2%      | 1,816     |
| TOTAL SPECIAL            | 22.4% | 77,880    | 9.1%  | 38,192    | 15.1% | 12,183    | 15.1%     | 128,255   |
| TOTAL WASTE STREAM       | 100%  | 348,260   | 100%  | 418,625   | 100%  | 80,682    | 100%      | 847,567   |

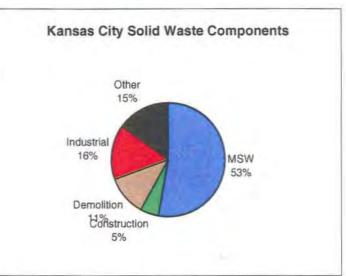
<sup>\*</sup> Based on observation data

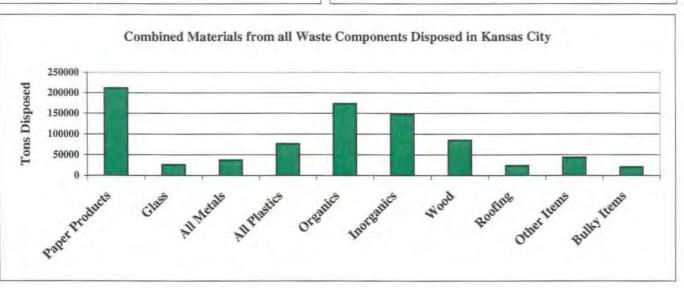
<sup>\*\*</sup> Based on weighted average from Southeast and Courtney Ridge.

#### KANSAS CITY SOLID WASTE COMPONENTS









# Large Metropolitan Solid Waste Components

The landfills within the two large metropolitan areas within Missouri disposed of 2,614,920 tons of solid waste in 1998. There was of course some import and export of waste so it is difficult to determine waste generation numbers without a long term, tedious study to track every load of solid waste.

The Table on page 152 lists the percentage of solid waste components and the materials within those components, based on observation data. The estimated tonnage is the 1998 tonnage of the combined landfills multiplied by the observed percentage.

The St. Louis numbers include the construction and demolition landfills at Peerless and Rockhill, but the Kansas City numbers do not include any construction and demolition landfills. The only C&D landfills in the Kansas City metropolitan area is located in Kansas and therefore not part of this study.

The Chart on page 153 illustrates the waste distribution and composition for St. Louis and Kansas City solid waste. The bar graph at the top of page 153 depicts the difference in the Kansas City and St. Louis waste components. The bar graph at the bottom of page 153 illustrates the tonnage for all materials regardless of their origins. The materials are combined into the following categories:

Paper: Includes MSW, construction cardboard, industrial cardboard and paper.

Glass: MSW only

Metals: Includes metals from MSW, construction, demolition, and industrial.

Plastics: Includes MSW, construction, and industrial.

**Organics:** Includes MSW, industrial food, textiles, and rubber.

Inorganics: Includes MSW, construction and demolition drywall, construction and demolition

masonry, and soil

Wood: Includes construction, demolition, and industrial wood.

Roofing: Demolition roofing only

Other Items: Includes "other" items from each component plus demolition carpet and asbestos.

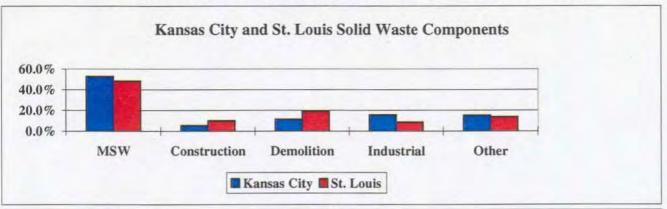
Bulky Items: Includes furniture and other materials too large to be disposed in bags.

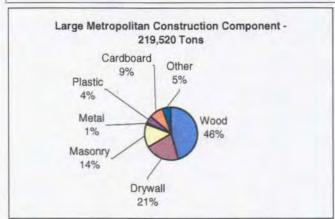
# LARGE METROPOLITAN SOLID WASTE COMPONENTS

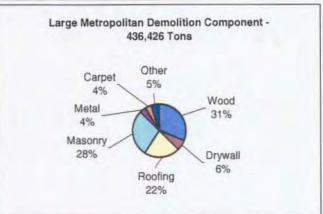
| MATERIAL                 | Kansas | City      | St. Loui | is        | Total Lar | ge Metro  |
|--------------------------|--------|-----------|----------|-----------|-----------|-----------|
|                          | Pct.   | Estimated | Pct.     | Estimated | Pct.      | Estimated |
| Municipal Solid Waste    |        | Tonnage   |          | Tonnage*  |           | Tonnage   |
| Paper                    | 19.4%  | 164,524   | 18.0%    | 318,601   | 18.5%     | 483,125   |
| Glass                    | 3.1%   | 25,931    | 2.8%     | 49,540    | 2.9%      | 75,471    |
| Metals                   | 3.6%   | 30,738    | 3.3%     | 58,831    | 3.4%      | 89,569    |
| Plastics                 | 7.6%   | 64,349    | 7.0%     | 123,073   | 7.2%      | 187,422   |
| Organics                 | 16.2%  | 137,617   | 14.9%    | 263,068   | 15.3%     | 400,685   |
| Inorganics               | 2.5%   | 21,391    | 2.3%     | 40,973    | 2.4%      | 62,364    |
| TOTAL MSW                | 52.7%  | 446,813   | 48.3%    | 854,085   | 49.7%     | 1,300,898 |
| Construction Waste       |        |           |          |           |           |           |
| Wood                     | 2.7%   | 22,625    | 4.4%     | 77,341    | 3.8%      | 99,966    |
| Dry Wall                 | 1.0%   | 8,198     | 2.1%     | 37,269    | 1.7%      | 45,467    |
| Masonry                  | 0.8%   | 6,840     | 1.4%     | 24,770    | 1.2%      | 31,610    |
| Metal                    | 0.2%   | 1,484     | 0.1%     | 1,162     | 0.1%      | 2,646     |
| Plastic                  | 0.3%   | 2,583     | 0.4%     | 6,661     | 0.4%      | 9,244     |
| Cardboard                | 0.4%   | 3,456     | 0.9%     | 15,792    | 0.7%      | 19,248    |
| Other                    | 0.1%   | 470       | 0.6%     | 11,272    | 0.4%      | 11,742    |
| TOTAL CONSTRUCTION       | 5.4%   | 45,576    | 9.9%     | 174,267   | 8.4%      | 219,843   |
| Demolition Waste         |        |           |          |           |           |           |
| Wood                     | 3.9%   | 32,968    | 5.8%     | 102,996   | 5.2%      | 135,964   |
| Dry Wall                 | 0.9%   | 7,697     | 1.1%     | 19,615    | 1.0%      | 27,312    |
| Roofing                  | 2.8%   | 23,566    | 4.0%     | 70,139    | 3.6%      | 93,705    |
| Masonry                  | 2.4%   | 20,194    | 5.9%     | 104,053   | 4.8%      | 124,247   |
| Metal                    | 0.5%   | 4,189     | 0.7%     | 12,866    | 0.7%      | 17,055    |
| Carpet                   | 0.5%   | 3,888     | 0.7%     | 12,294    | 0.6%      | 16,182    |
| Other                    | 0.4%   | 3,475     | 1.1%     | 18,809    | 0.9%      | 22,284    |
| TOTAL DEMOLITION         | 11.3%  | 95,896    | 19.3%    | 340,772   | 16.7%     | 436,668   |
| Industrial Waste         |        |           |          |           |           |           |
| Cardboard                | 3.9%   | 33,175    | 3.0%     | 53,745    | 3.3%      | 86,920    |
| Paper                    | 1.3%   | 10,721    | 0.7%     | 12,546    | 0.9%      | 23,267    |
| Food                     | 4.3%   | 36,180    | 0.1%     | 1,395     | 1.4%      | 37,575    |
| Metal                    | 0.1%   | 549       | 0.1%     | 945       | 0.1%      | 1,494     |
| Wood                     | 3.5%   | 29,672    | 2.4%     | 42,537    | 2.8%      | 72,209    |
| Plastic                  | 1.1%   | 9,458     | 0.8%     | 14,548    | 0.9%      | 24,006    |
| Textiles                 | 0.0%   |           | 0.1%     | 2,496     | 0.1%      | 2,496     |
| Rubber                   | 0.0%   |           | 0.7%     | 12,507    | 0.5%      | 12,507    |
| Other                    | 1.3%   | 11,271    | 0.8%     | 13,409    | 0.9%      | 24,680    |
| TOTAL INDUSTRIAL         | 15.5%  | 131,027   | 8.7%     | 154,129   | 10.9%     | 285,156   |
| Special Wastes           |        |           |          |           |           |           |
| Bulky Items              | 2.4%   | 20,396    | 1.2%     | 21,022    | 1.6%      | 41,418    |
| Soil and Inert Materials | 9.8%   | 83,287    | 9.8%     | 173,867   | 9.8%      | 257,154   |
| Asbestos                 | 2.7%   | 22,755    | 0.6%     | 10,829    | 1.3%      | 33,584    |
| Other                    | 0.2%   | 1,816     | 2.2%     | 38,383    | 1.5%      | 40,199    |
| TOTAL SPECIAL            | 15.1%  | 128,255   | 13.8%    | 244,100   | 14.2%     | 372,355   |
| TOTAL WASTE STREAM       | 100%   | 847,567   | 100%     | 1,767,353 | 100%      | 2,614,920 |

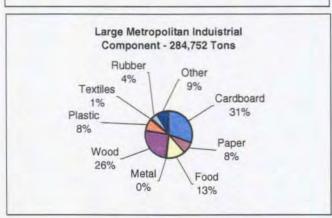
<sup>\*</sup>Includes Rockhill and Peerless C&D landfills

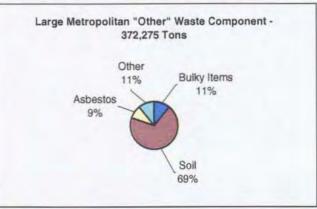
### LARGE METROPOLITAN SOLID WASTE COMPONENTS

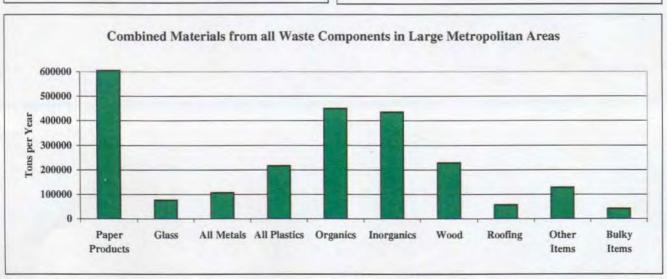












# SMALL METROPOLITAN AREAS

There are three small metropolitan areas within the state of Missouri according to the Missouri State Census Data Center. These are the Springfield metropolitan area (240,593), The Columbia metropolitan area (112,379), and the St. Joseph metropolitan area (83,083). The remaining population centers are classified as rural.

The three metropolitan areas have different waste characteristics than St. Louis or Kansas City. They also have different waste characteristics than their rural counterparts.

#### City of Columbia

The City of Columbia owns and operates their own landfill. They also operate a fleet of refuge trucks that collect all of the residential waste within the City of Columbia and most of the commercial waste. The City of Columbia has been active in waste management for several years and have implemented some very progressive waste reduction and recycling programs. Columbia is the only City in the U.S. to have an independent bottle deposit bill. Landfill observation was done in October of 1998 and results are on page 27.

#### City of St. Joseph

The City of St. Joseph also owns and operates their landfill. However the City has contracted the residential waste hauling to Deffenbaugh waste services and all residential and commercial waste collected within the city limits by Deffenbaugh is hauled to their landfill in Kansas. However, industrial waste in compactor units and roll-off were delivered to the St. Joseph Landfill. The landfill observation was done in November of 1998 and results are on page 33.

#### City of Springfield

The City of Springfield owns and operates their own landfill but due to limited time and resources this landfill was not observed. However, from a waste perspective, Springfield is like St. Joseph in many ways. BFI, which hauls to their landfill in Lamar, or Waste Management Inc., which hauls to their landfill in Hartsville (Black Oak), collect most of the residential and commercial waste in Springfield. Both the Lamar and Black Oak landfills were observed. The Springfield landfill receives less waste than any of the other landfills observed. Although Springfield is the third largest metropolitan area in the state, the landfill only received 101,284 tons in 1998. The percentage of waste found at the St. Joseph Landifll was applied to the tonnage for Springfield.

#### Waste Components for Small Metropolitan Areas

There were some significant differences in the solid waste components of small metropolitan areas when compared to large metro areas and rural areas. The MSW component was much less than either the large metro landfills or the rural landfills. The waste components at the City of Columbia landfill was very close to state averages, but the St. Joseph (and Springfield because it was considered similar to St. Joseph) percentages were very different.

The table on page 156 list the results for the three small metro landfills observed, and the charts on page 157 illustrate those findings.

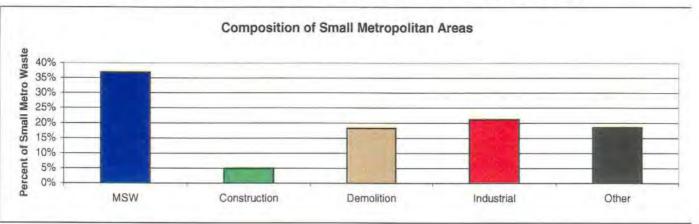
# SMALL METROPOLITAN SOLID WASTE COMPONENTS

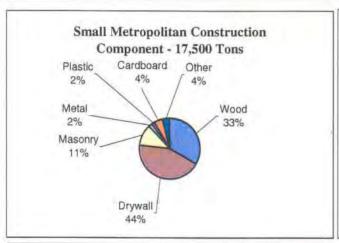
| MATERIAL                 | Colu  | mbia  | St. J | loseph    | Spr   | ingfield                                | Total | Small Metro                             |
|--------------------------|-------|---|-------|-----------|-------|---|-------|---|
|                          | Pct.  | Estimated                                   | Pct.  | Estimated | Pct.  | Estimated                               | Pct.  | Estimated                               |
| Municipal Solid Waste    |       | Tonnage*                                    |       | Tonnage*  |       | Tonnage**                               | No.   | Tonnage                                 |
| Paper                    | 24.1% | 30,285                                      | 10.0% | 11,995    | 10.0% | 10,128                                  | 15.1% | 52,408                                  |
| Glass                    | 2.1%  |   | 1.6%  | 1,943     | 1.6%  |   | 1.8%  |   |
| Metals                   | 3.1%  | 200000000000                                | 1.8%  | 2,186     | 1.8%  |   | 2.3%  |   |
| Plastics                 | 7.2%  | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1       | 3.2%  | 3,852     | 3.2%  | 0.0000000000000000000000000000000000000 | 4.7%  |   |
| Organics                 | 16.3% |   | 7.4%  | 8,939     | 7.4%  |   | 10.6% | 100000000000000000000000000000000000000 |
| Inorganics               | 5.0%  | EAST-100-100-100-100-100-100-100-100-100-10 | 1.0%  | 1,246     | 1.0%  | 41.00                                   | 2.5%  | 8,582                                   |
| TOTAL MSW                | 57.8% | 001.730236                                  | 25.1% | 30,161    | 25.1% |   | 36.9% |   |
| Construction Waste       |       |   |       |           |       |   |       |   |
| Wood                     | 4.0%  | 4,975                                       | 1.5%  | 1,759     | 1.5%  | 1,519                                   | 2.4%  | 8,253                                   |
| Dry Wall                 | 1.3%  | 1,693                                       | 0.8%  | 957       | 0.8%  | 810                                     | 1.0%  | 3,461                                   |
| Masonry                  | 0.3%  | 408   | 1.1%  | 1,315     | 1.1%  | 1,114                                   | 0.8%  | 2,837                                   |
| Metal                    | 0.2%  | 288   | 0.1%  | 87        | 0.1%  | 101                                     | 0.1%  | 476                                     |
| Plastic                  | 0.2%  | 246   | 0.1%  | 63        | 0.1%  | 101                                     | 0.1%  | 411                                     |
| Cardboard                | 0.7%  | 850   | 0.1%  | 161       | 0.1%  | 101                                     | 0.3%  | 1,113                                   |
| Other                    | 0.7%  | 892   | 0.0%  | 58        | 0.0%  | -                                       | 0.3%  | 950                                     |
| TOTAL CONSTRUCTION       | 7.4%  | 9,352                                       | 3.7%  | 4,400     | 3.7%  | 3,748                                   | 5.0%  | 17,500                                  |
| Demolition Waste         |       |   |       |           |       |   |       |   |
| Wood                     | 4.1%  | 5,200                                       | 11.2% | 13,437    | 11.2% | 11,344                                  | 8.6%  | 29,980                                  |
| Dry Wall                 | 1.1%  | 1,440                                       | 0.9%  | 1,119     | 0.9%  | 912                                     | 1.0%  | 3,471                                   |
| Roofing                  | 3.8%  | 4,722                                       | 3.8%  | 4,585     | 3.8%  | 3,849                                   | 3.8%  | 13,155                                  |
| Masonry                  | 3.0%  | 3,724                                       | 3.8%  | 4,527     | 3.8%  | 3,849                                   | 3.5%  | 12,100                                  |
| Metal                    | 0.5%  | 576   | 0.2%  | 294       | 0.2%  | 203                                     | 0.3%  | 1,073                                   |
| Carpet                   | 0.3%  | 415   | 0.8%  | 963       | 0.8%  | 810                                     | 0.6%  | 2,188                                   |
| Other                    | 1.0%  | 1,209                                       | 0.2%  | 242       | 0.2%  | 203                                     | 0.5%  | 1,653                                   |
| TOTAL DEMOLITION         | 13.7% | 17,285                                      | 20.9% | 25,167    | 20.9% | 21,168                                  | 18.3% | 63,620                                  |
| Industrial Waste         |       |   |       |           |       |   |       |   |
| Cardboard                | 5.3%  | 6,682                                       | 3.5%  | 4,169     | 3.5%  | 3,545                                   | 4.1%  | 14,397                                  |
| Paper                    | 1.2%  | 1,462                                       | 2.1%  | 2,560     | 2.1%  | 2,127                                   | 1.8%  | 6,149                                   |
| Food                     | 1.4%  | 1,806                                       | 8.1%  | 9,688     | 8.1%  | 8,204                                   | 5.7%  | 19,698                                  |
| Metal                    | 0.1%  | 155   | 0.9%  | 1,044     | 0.9%  | 912                                     | 0.6%  | 2,110                                   |
| Wood                     | 3.0%  | 3,787                                       | 3.6%  | 4,308     | 3.6%  | 3,646                                   | 3.4%  | 11,741                                  |
| Plastic                  | 4.6%  | 5,818                                       | 1.3%  | 1,569     | 1.3%  | 1,317                                   | 2.5%  | 8,703                                   |
| Textiles                 | 0.2%  | 253   | 0.0%  | . 1       | 0.0%  | - 1                                     | 0.1%  | 253                                     |
| Rubber                   | 0.6%  | 752   | 0.0%  | 4 8       | 0.0%  | - 1                                     | 0.2%  | 752                                     |
| Other                    | 1.7%  | 2,101                                       | 3.5%  | 4,198     | 3.5%  | 3,545                                   | 2.8%  | 9,844                                   |
| TOTAL INDUSTRIAL         | 18.1% | 22,815                                      | 22.9% | 27,537    | 22.9% | 23,194                                  | 21.2% | 73,546                                  |
| Special Wastes           |       |   |       | 22.00     |       |   |       |   |
| Bulky Items              | 1.7%  | 2,185                                       | 1.3%  | 1,569     | 1.3%  | 1,317                                   | 1.5%  | 5,071                                   |
| Soil and Inert Materials | 0.0%  | -   | 25.4% | 30,564    | 25.4% | 25,726                                  | 16.2% | 56,290                                  |
| Asbestos                 | 0.0%  | 4   | 0.6%  | 761       | 0.6%  | 608                                     | 0.4%  | 1,369                                   |
| Other                    | 1.2%  | 1,490                                       | 0.0%  | - 1       | 0.0%  |   | 0.4%  | 1,490                                   |
| TOTAL SPECIAL            | 2.9%  | 3,675                                       | 27.4% | 32,894    | 27.4% | 27,752                                  | 18.5% | 64,321                                  |
| TOTAL WASTE STREAM       | 100%  | 125,867                                     | 100%  | 120,158   | 100%  | 101,284                                 | 100%  | 347,309                                 |

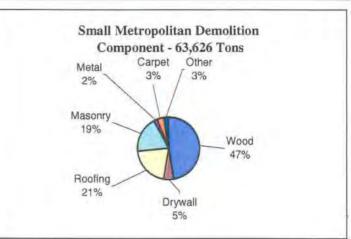
<sup>\*</sup> Based on observation data

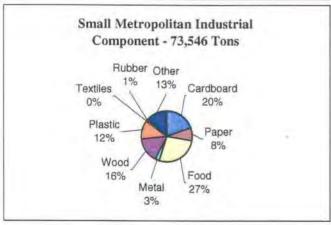
<sup>\*\*</sup>City of Springfield landfill was not observed. Estimates are based on the City of St. Joseph landfill.

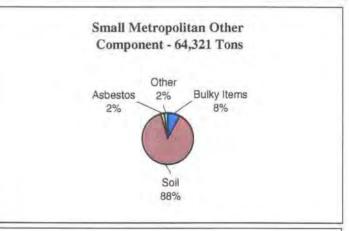
### SMALL METROPOLITAN SOLID WASTE COMPONENTS

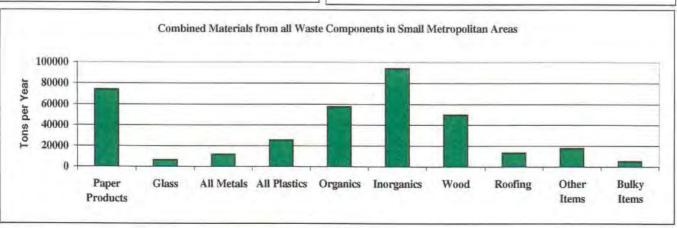












# **RURAL AREAS**

Much of the state of Missouri is rural. There are some larger cities outside of the metropolitan areas (Joplin 41,000, Cape Girardeau 35,000, and Jefferson City 35,000), but for the most part these areas are sparsely populated compared to the metropolitan areas. The population of rural Missouri is about two million. The following rural landfills were observed.

#### Black Oak

The Black Oak Landfill is located near Hartsville, MO and is owned and operated by Waste Management Inc. The large majority of waste received at their landfill was MSW from their transfer stations in Springfield, Lebanon, Roll, and St. Roberts. Since the landfill was observed, the operation of two of the transfer stations (Phelps County and St. Roberts) has been taken over by Superior Waste Services, and the waste from these transfer stations are no going to the Oak Ridge Landfill in St. Louis County. The landfill observation was conducted in April and the results are on page 9.

#### **Butler County**

The Butler County Landfill is located near Poplar Bluff, MO and is owned and operated by Allied Waste Services. Much of their waste is MSW received from independent transfer stations in Park Hills, Fredericktown, and the Bootheel. The landfill observation was conducted in October 1998 and the results are on page 21.

#### Lamar Landfill

The Lamar Landfill is located near Lamar, MO and is owned and operated by BFI. Much of their waste is MSW received from their transfer station in Springfield. The landfill observation was conducted in October 1998 and the results are on page 51.

#### Lemons Landfill

The Lemons Landfill is located near Dexter, MO and is operated by Allied Waste Services. Much of their waste is MSW received from transfer stations in Cape Girardeau, Jackson, and Pemiscot County. Landfill observation was conducted in January 1999. The results are on page 57.

#### Maple Hill Landfill

The Maple Hill Landfill is located near Macon, MO. and is owned and operated by Superior Waste Services. Much of their waste was MSW received from their own fleet of packer trucks and transfer stations in Bethany and Mexico, MO. The landfill observation was conducted in April 1999 and the results are on page 63.

#### Waste Components of Rural Landfills

Almost 82% of the waste received in rural landfills was MSW. They received about the same percentage of industrial waste as the state average but were considerably lower in construction, demolition and other waste categories.

The table on pages 160 and 161 list the results for the five rural landfills observed and the estimated waste components for rural landfills not observed. The charts on pages 163 and 165 illustrate those findings.

| MATERIAL                 | Black ( | Dak       | Butler | Co.       | Lamar |                      | Lemons | 3         |
|--------------------------|---------|-----------|--------|-----------|-------|----------------------|--------|-----------|
|                          | Pct.    | Estimated | Pct.   | Estimated | Pct.  | Estimated            | Pct.   | Estimated |
| Municipal Solid Waste    |         | Tonnage*  |        | Tonnage*  |       | Tonnage*             |        | Tonnage*  |
| Paper                    | 35.6%   | 100,943   | 27.7%  | 33,823    | 27.0% | 45,467               | 26.5%  | 51,961    |
| Glass                    | 5.5%    | 15,711    | 4.2%   | 5,135     | 3.8%  | 6,339                | 4.1%   | 8,105     |
| Metals                   | 6.6%    | 18,671    | 6.2%   | 7,556     | 5.5%  | 9,203                | 4.9%   | 9,608     |
| Plastics                 | 13.7%   | 38,935    | 11.0%  | 13,399    | 11.9% | 20,052               | 10.2%  | 20,065    |
| Organics                 | 29.4%   | 83,335    | 23.8%  | 29,101    | 25.3% | 42,725               | 21.9%  | 42,941    |
| Inorganics               | 4.6%    | 12,978    | 3.5%   | 4,250     | 3.3%  | 5,565                | 3.4%   | 6,667     |
| TOTAL MSW                | 95.4%   | 270,573   | 76.3%  | 93,263    | 76.7% | and the first second | 71.1%  | 139,347   |
| Construction Waste       | E E     |           |        |           |       |                      |        |           |
| Wood                     | 0.1%    | 304       | 0.7%   | 885       | 0.3%  | 581                  | 0.2%   | 425       |
| Dry Wall                 | 0.0%    | 76        | 0.8%   | 1,003     | 0.0%  | 43                   | 0.1%   | 288       |
| Masonry                  | 0.3%    | 911       | 0.0%   | 2.77      | 0.0%  | - 1                  | 0.0%   |           |
| Metal                    | 0.0%    |           | 0.0%   | -         | 0.1%  | 112                  | 0.0%   |           |
| Plastic                  | 0.0%    | 4         | 0.0%   | m v 1     | 0.0%  | 140                  | 0.0%   |           |
| Cardboard                | 0.0%    | 76        | 0.1%   | 177       | 0.1%  | 101                  | 0.0%   | -         |
| Other                    | 0.0%    |           | 0.2%   | 302       | 0.2%  | 293                  | 0.0%   | -         |
| TOTAL CONSTRUCTION       | 0.5%    | 1,366     | 1.9%   | 2,368     | 0.7%  | 1,129                | 0.4%   | 712       |
| Demolition Waste         |         |           |        |           |       |                      |        |           |
| Wood                     | 0.3%    | 759       | 1.1%   | 1,328     | 1.7%  | 2,798                | 2.9%   | 5,752     |
| Dry Wall                 | 0.1%    | 228       | 1.9%   | 2,278     | 0.1%  | 222                  | 0.6%   | 1,111     |
| Roofing                  | 0.3%    | 835       | 3.8%   | 4,657     | 3.7%  | 6,156                | 2.1%   | 4,052     |
| Masonry                  | 0.1%    | 152       | 0.2%   | 285       | 0.2%  | 282                  | 1.2%   | 2,353     |
| Metal                    | 0.0%    | 76        | 0.0%   |           | 0.2%  | 410                  | 0.1%   | 294       |
| Carpet                   | 0.2%    | 455       | 0.8%   | 950       | 0.5%  | 890                  | 0.4%   | 719       |
| Other                    | 0.1%    | 379       | 0.0%   | -         | 0.4%  | 646                  | 0.0%   | 65        |
| TOTAL DEMOLITION         | 1.0%    | 2,884     | 7.8%   | 9,499     | 6.8%  | 11,403               | 7.3%   | 14,346    |
| Industrial Waste         |         |           |        |           |       | 1                    |        |           |
| Cardboard                | 0.7%    | 1,897     | 0.4%   | 515       | 2.3%  | 3,797                | 1.2%   | 2,418     |
| Paper                    | 0.3%    | 835       | 0.3%   | 322       | 0.4%  | 616                  | 3.6%   | 7,124     |
| Food                     | 0.0%    | -         | 0.0%   | 4         | 0.0%  | -                    | 0.9%   | 1,765     |
| Metal                    | 0.0%    |           | 0.0%   |           | 0.6%  | 1,085                | 0.1%   | 131       |
| Wood                     | 0.6%    | 1,594     | 0.3%   | 386       | 0.7%  | 1,207                | 2.4%   | 4,641     |
| Plastic                  | 0.1%    | 304       | 0.4%   | 515       | 0.7%  | 1,128                | 2.4%   | 4,771     |
| Textiles                 | 0.0%    | -         | 1.4%   | 1,670     | 0.8%  | 1,359                | 0.7%   | 1,438     |
| Rubber                   | 0.0%    |           | 2.5%   | 3,022     | 0.3%  | 524                  | 0.6%   | 1,176     |
| Other                    | 0.0%    | 15.0      | 7.7%   | 9,350     | 9.2%  | 15,432               | 8.8%   | 17,255    |
| TOTAL INDUSTRIAL         | 1.6%    | 4,630     | 12.9%  | 15,780    | 14.9% | 25,147               | 20.8%  | 40,719    |
| Special Wastes           |         |           |        |           |       |                      |        |           |
| Bulky Items              | 1.4%    | 4,023     | 1.0%   | 1,275     | 0.5%  | 823                  | 0.5%   | 967       |
| Soil and Inert Materials | 0.0%    | -         | 0.0%   | .,        | 0.0%  | - 1                  | 0.0%   |           |
| Asbestos                 | 0.0%    | - 1       | 0.0%   |           | 0.4%  | 737                  | 0.0%   | -         |
| Other                    | 0.0%    |           | 0.0%   |           | 0.0%  |                      | 0.0%   |           |
| TOTAL SPECIAL            | 1.4%    | 4,023     | 1.0%   | 1,275     | 0.9%  | 1,560                | 0.5%   | 967       |
| TOTAL WASTE STREAM       | 100%    | 283,475   | 100%   | 122,185   | 100%  | 168,591              | 100%   | 196,092   |

<sup>\*</sup> Based on observation data

 $<sup>^{**}</sup>$  Based on the weighted average from the 5 observed landfills and the 2 C&D landfills observed.

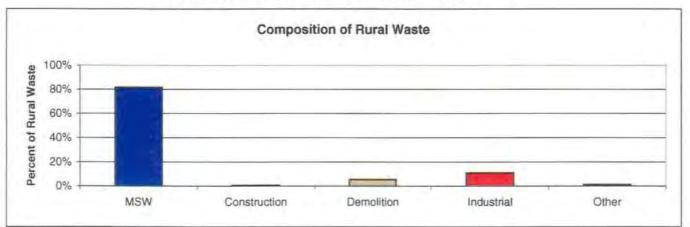
<sup>\*\*\*</sup> Total estimated material based on observation data and weighted average from remaining rural landfills.

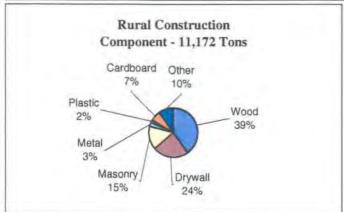
| Tonnage  | Maple I |  |        |  |        | ıral Landfills   | MATERIAL   |
|--|---------|--|--------|--|--------|--|--|
| 29.1%   33,441   30.0%   192,321   30.0%   457,956   68,848   61,52   5.8%   37,054   5.8%   88,243   Metals   Plastics   25.2%   28,991   25.7%   164,434   25.7%   391,527   391,527   24.9%   2,749   3.6%   23,335   3.6%   25,543   30.0%   457,956   Plastics   Organics   Inorganics   TOTAL MSW  | Pct.    |  | Pct.   |  | Pct.   | Estimated  |  |
| 4.0% 4,646 4.5% 28,912 4.5% 68,848 5.4% 6,152 5.8% 37,054 12.0% 182,669 11.7% 13,481 12.0% 76,736 12.0% 182,669 25.2% 28,991 25.7% 164,434 25.7% 391,527 2.4% 2,749 3.6% 23,335 3.6% .55,543 1norganics TOTAL MSW 2.749 3.1% 3.2% 3.2% 3.2% 3.2% 3.2% 3.2% 3.2% 3.2  | 00 40/  |  | 00.00/ | 3000   | 00.00/ |  |  |
| 5.4%         6,152         5.8%         37,054         5.8%         88,243         Metals           11.7%         13,481         12.0%         76,736         12.0%         182,669         Plastics           25.2%         28,991         25.7%         164,434         25.7%         391,527         Organics           77.8%         89,460         81.6%         522,792         81.6%         55,543         Inorganics           77.8%         89,460         81.6%         522,792         81.6%         1,244,785         TOTAL MSW           0.3%         393         0.3%         1,859         0.3%         4,447         Metal           0.1%         65         0.1%         705         0.1%         1,681         Masonry           0.1%         65         0.0%         128         0.0%         305         Metal           0.1%         65         0.1%         4.49         0.1%         1,109         Other           0.1%         65         0.1%         4.49         0.1%         1,109         Other           0.8%         916         0.7%         4,680         0.7%         11,172         TOTAL CONSTRUCTION           0.9%         1,047  |         |  |        |  |        |  | the state of the s |
| 11.7%   13.481   12.0%   76.736   12.0%   391,527   24.991   25.7%   164,434   25.7%   391,527   |         |  |        |  |        | No. No. of Contract of Contrac |  |
| 25.2%         28,991         25.7%         164,434         25.7%         391,527         Organics Inorganics I  |         |  |        |  |        |  |  |
| 2.4%   2,749   3.6%   23,335   3.6%   5.5,543   81.6%   1,244,785   TOTAL MSW  |         |  |        | 200  |        |  |  |
| 77.8% 89,460 81.6% 522,792 81.6% 1,244,785 TOTAL MSW  0.3% 393 0.3% 1,859 0.3% 4,447 Wood 0.1% 131 0.2% 1,090 0.2% 2,630 Dry Wall 0.1% 65 0.1% 705 0.1% 1,681 Masonry 0.1% 65 0.0% 128 0.0% 305 Metal 0.1% 65 0.1% 321 0.0% 740 Cardboard 0.1% 65 0.1% 321 0.0% 740 Cardboard 0.1% 65 0.1% 449 0.7% 11,172 TOTAL CONSTRUCTION 0.8% 916 0.7% 4,680 0.7% 11,172 TOTAL CONSTRUCTION  1.5% 1,767 2.0% 12,629 2.0% 30,096 Roofing 0.2% 262 0.4% 2,436 0.4% 5,770 Masonry 0.5% 524 0.2% 962 0.1% 2,265 Metal 0.3% 393 0.4% 2,436 0.4% 5,843 Carpet 0.6% 654 0.2% 1,282 0.2% 30,07 Metal 0.9% 1,047 1.1% 6,988 1.1% 16,662 Cardboard 0.2% 262 1.0% 6,603 1.0% 5,843 Carpet 0.6% 654 0.2% 1,346 0.2% 3,216 Metal 0.9% 1,047 1.1% 6,988 1.1% 16,662 Cardboard 0.2% 262 1.0% 6,603 1.0% 15,761 Paper 0.6% 654 0.2% 1,346 0.2% 3,216 Metal 0.7% 851 1.0% 6,282 1.0% 14,960 Plastic 0.7% 851 1.0% 6,282 1.0% 14,960 Plastic 0.4% 458 0.6% 3,590 0.6% 8,516 1.1% 1,243 0.7% 4,295 0.7% 10,261 1.1% 1,243 0.7% 4,295 0.7% 10,2 |         |  |        |  |        |  |  |
| 0.3% 393 0.3% 1,859 0.3% 4,447 Wood Dry Wall 0.1% 131 0.2% 1,090 0.2% 2,630 Dry Wall Masonry Metal 0.1% 65 0.0% 128 0.0% 305 Metal 0.1% 65 0.1% 321 0.0% 740 Cardboard 0.1% 65 0.1% 449 0.1% 1,109 Other TOTAL DEMOLITION 1.5% 1,676 1.06% 3.526 0.6% 8,413 Dry Wall Roofing 0.2% 2,626 0.4% 2,436 0.4% 5,770 Masonry Metal 0.3% 393 0.4% 2,436 0.4% 5,770 Masonry Metal 0.3% 393 0.4% 2,436 0.4% 5,770 Masonry Metal 0.3% 393 0.4% 2,436 0.4% 5,843 Carpet 0.6% 654 0.2% 1,282 0.2% 3,027 Other TOTAL DEMOLITION 1.09% 1,047 1.1% 6,988 1.1% 16,662 0.2% 3,338 0.4% 2,436 0.4% 5,770 Masonry Metal 0.2% 262 1.0% 6,603 1.0% 15,761 Demolition Waste 0.2% 3,338 0.4% 2,436 0.4% 5,40% 82,241 Dry Wall Roofing 0.2% 262 1.0% 6,603 1.0% 15,761 Demolition Waste 0.2% 3,338 1.1% 7,308 1.1% 17,363 0.6% 654 0.2% 1,346 0.2% 3,216 Metal 0.2% 3,338 1.1% 7,308 1.1% 17,363 0.6% 654 0.2% 1,346 0.2% 3,216 Metal 0.2% 458 0.6% 3,590 0.6% 8,516 1.1% 1,243 0.7% 4,295 0.7% 10,261 Textiles Rubber 0.4% 458 0.6% 3,590 0.6% 8,516 1.1% 1,243 0.7% 4,295 0.7% 10,261 Textiles Rubber 0.4% 458 0.6% 3,590 0.6% 8,516 1.1% 1,243 0.7% 4,295 0.7% 10,261 Rubber 0.4% 11.1% 1,243 0.7% 4,295 0.7% 10,261 Rubber 0.4% 458 0.6% 3,590 0.6% 8,516 1.1% 1,243 0.7% 4,295 0.7% 10,261 Rubber 0.4% 458 0.6% 3,590 0.6% 8,516 1.1% 1,243 0.7% 4,295 0.7% 10,261 Rubber 0.4% 458 0.6% 3,590 0.6% 8,516 1.1% 1,243 0.7% 4,295 0.7% 10,261 Rubber 0.4% 458 0.6% 3,590 0.6% 8,516 1.1% 1,243 0.7% 4,295 0.7% 10,261 Rubber 0.4% 458 0.6% 3,590 0.6% 8,516 1.1% 1,243 0.7% 4,295 0.7% 10,261 Rubber 0.4% 458 0.6% 3,590 0.6% 8,516 Rubber 0.4% 458 0.6% 3,590 0.6% 8,516 Rubber 0.4% 458 0.6% 3,590 0.6% 8,516 Rubber 0.5% 11.1% 1,243 0.7% 4,295 0.7% 10,261 Rubber 0.5% 11.1% 1,243 0.7% 4,295 0.7% 10,261 Rubber 0.5% 11.1% 1,309 0.2% 962 0.1% 2,270 0.5% 11.1% 1,309 0.2% 962 0.1% 2,270 0.1% |         | 200  |        |  |        |  |  |
| 0.3%         393         0.3%         1,859         0.3%         4,447         Wood         Dry Wall           0.1%         131         0.2%         1,090         0.2%         2,630         Dry Wall           0.1%         65         0.1%         705         0.1%         1,681         Masonry           0.1%         65         0.0%         128         0.0%         305         Metal           0.1%         65         0.1%         321         0.0%         740         Cardboard           0.1%         65         0.1%         321         0.0%         740         Cardboard           0.1%         65         0.1%         4.90         0.7%         1,109         Other           0.8%         916         0.7%         4,680         0.7%         11,172         Dother           0.8%         916         0.7%         4,680         0.7%         11,172         Dother           0.8%         1,047         0.6%         3,526         0.6%         8,413         Dry Wall           1.5%         1,677         2.0%         12,629         2.0%         30,096         Roofing           0.2%         262         0.4%   | 77.8%   | 89,460   | 81.6%  | 522,792  | 81.6%  | 1,244,785  | TOTAL MSW  |
| 0.1%         131         0.2%         1,090         0.2%         2,630         Dry Wall           0.1%         65         0.1%         705         0.1%         1,681         Masonry           0.1%         65         0.0%         128         0.0%         305         Plastic           0.1%         131         0.0%         64         0.0%         195         Plastic           0.1%         65         0.1%         321         0.0%         740         Other           0.8%         916         0.7%         4,680         0.7%         11,109         Other           0.8%         916         0.7%         4,680         0.7%         11,172         Demolition Waste           4.3%         4,908         1.8%         11,283         1.8%         26,827         Dry Wall           1.5%         1,047         0.6%         3,526         0.6%         8,413         Dry Wall           1.5%         1,767         2.0%         12,629         2.0%         30.096         Roofing           0.2%         262         0.4%         2,436         0.4%         5,770         Metal           0.3%         393         0.4%         2,436   |         |  | 2-240  | Ŧ  |        |  |  |
| 0.1%         65         0.1%         705         0.1%         1,681         Masonry           0.1%         65         0.0%         128         0.0%         305         Metal           0.1%         131         0.0%         64         0.0%         195         Cardboard           0.1%         65         0.1%         449         0.0%         195         Other           0.1%         65         0.1%         449         0.0%         195         Other           0.8%         916         0.7%         4,680         0.7%         11,172         Other           Demolition Waste           4.3%         4,908         1.8%         11,283         1.8%         26,827         Wood           0.9%         1,047         0.6%         3,526         0.6%         8,413         Dry Wall           1.5%         1,767         2.0%         12,629         2.0%         30,096         Roofing           0.2%         262         0.4%         2,436         0.4%         5,843         Carpto           0.3%         393         0.4%         2,436         0.4%         5,843         Carpet         Other           0.6%   |         |  |        | Control of the second  |        |  |  |
| 0.1%         65         0.0%         128         0.0%         305         Metal           0.1%         131         0.0%         64         0.0%         195         Cardboard           0.1%         65         0.1%         321         0.0%         740         Cordboard           0.1%         65         0.1%         449         0.1%         1.109         Other           0.8%         916         0.7%         4,680         0.7%         11,172         TOTAL CONSTRUCTION           0.8%         916         0.7%         4,680         0.7%         11,172         TOTAL CONSTRUCTION           0.8%         916         0.7%         4,680         0.7%         11,172         TOTAL CONSTRUCTION           0.9%         1,047         0.6%         3,526         0.6%         8,413         Dry Wall           1.5%         1,767         2.0%         12,629         2.0%         30,096         Roofing           0.2%         262         0.4%         2,436         0.4%         5,770         Metal           0.3%         393         0.4%         2,436         0.4%         5,843         Carpet           0.6%         654         0.2%   |         |  |        | 200  |        |  |  |
| 0.1% 131 0.0% 64 0.0% 195 0.1% 65 0.1% 321 0.0% 740 0.1% 65 0.1% 449 0.1% 1,109 0.1% 1,109 0.8% 916 0.7% 4,680 0.7% 11,172 TOTAL CONSTRUCTION Demolition Waste Wood 0.9% 1,047 0.6% 3,526 0.6% 8,413 Dry Wall 1.5% 1,767 2.0% 12,639 0.4% 5,770 Masonry 0.5% 524 0.2% 962 0.1% 2,265 0.6% 654 0.2% 1,282 0.2% 3,027 0.6% 654 0.2% 1,282 0.2% 3,027 0.6% 654 0.2% 1,345 0.6% 8,241 TOTAL DEMOLITION 0.9% 1,047 1.1% 6,988 1.1% 16,662 Cardboard 0.2% 262 1.0% 6,603 1.0% 15,761 0.6% 654 0.2% 1,346 0.6% 8,691 0.6% 654 0.2% 1,346 0.2% 3,216 0.6% 654 0.2% 1,346 0.2% 1,346 0.2% 1,346 0.2% 1,346 0.2% 1,346 0.2% 1,346 0.2% 1,346 0.2% 1,346 0.2% 1,346 0.2% 1,346 0.2% 1, |         | 100  |        |  |        |  |  |
| 0.1% 65 0.1% 321 0.0% 740 0.1% 1,109 0.1% 65 0.1% 449 0.1% 1,109 0.8% 916 0.7% 4,680 0.7% 11,172 TOTAL CONSTRUCTION 11,174 0.6% 3,526 0.6% 8,413 Dry Wall Provided 1,1767 2.0% 12,629 2.0% 30,096 Paofing 0.2% 262 0.4% 2,436 0.4% 5,770 Masonry 1,05% 524 0.2% 962 0.1% 2,265 0.6% 654 0.2% 1,282 0.2% 3,027 Other 1,047 1.1% 6,988 1.1% 16,662 Cardboard 1,04% 15,761 0.2% 2,625 1.0% 6,603 1.0% 15,761 0.2% 2,625 1.0% 6,603 1.0% 15,761 0.6% 654 0.2% 1,346 0.2% 3,216 0.6% 654 0.2% 1,346 0.2% 3,216 0.6% 654 0.2% 1,346 0.2% 3,216 0.6% 654 0.2% 1,346 0.2% 3,216 0.6% 654 0.2% 1,346 0.2% 3,216 0.6% 654 0.2% 1,346 0.2% 3,216 0.6% 654 0.2% 1,346 0.2% 3,216 0.6% 654 0.2% 1,346 0.2% 3,216 0.4% 458 0.6% 3,590 0.6% 8,516 1.1% 1,243 0.7% 4,295 0.7% 10,261 1.1% 1,243 0.7% 4,295 0.7% 10,261 1.1% 1,243 1.9% 31,348 4.9% 74,629 10.8% 12,369 11.1% 71,415 11.1% 170,060 TOTAL INDUSTRIAL Special Wastes 1.2% 1,374 1.0% 6,154 1.0% 14,616 0.0% - 0.0% |         | See  |        | 200  |        |  |  |
| 0.1% 65 0.1% 449 0.1% 1,109 Other TOTAL CONSTRUCTION   0.8% 916 0.7% 4,680 0.7% 11,172 TOTAL CONSTRUCTION   0.8% 916 0.7% 4,680 0.7% 11,172 TOTAL CONSTRUCTION   0.8% 916 0.7% 4,680 0.7% 11,172 TOTAL CONSTRUCTION   0.9% 1,047 0.6% 3,526 0.6% 8,413 Dry Wall   1.5% 1,767 2.0% 12,629 2.0% 30,096 Roofing   0.2% 262 0.4% 2,436 0.4% 5,770 Masonry   0.5% 524 0.2% 962 0.1% 2,265   0.6% 654 0.2% 1,282 0.2% 3,027 Other   0.6% 654 0.2% 1,282 0.2% 3,027 Other   0.8% 3,393 0.4% 2,436 0.4% 5,843 Carpet   0.6% 654 0.2% 1,282 0.2% 3,027 Other   0.6% 654 0.2% 1,382 0.2% 3,027 Other   0.6% 654 0.2% 1,346 0.6% 8,691   0.6% 654 0.2% 1,346 0.6% 8,691   0.6% 654 0.2% 1,346 0.2% 3,216   0.6% 654 0.2% 1,346 0.2% 3,216   0.6% 654 0.2% 1,346 0.6% 8,691   0.6% 654 0.2% 1,346 0.2% 3,216   0.6% 654 0.2% 1,346 0.6% 8,691   0.6% 654 0.2% 1,346 0.6% 8,691   0.6% 654 0.2% 1,346 0.6% 8,691   0.6% 654 0.2% 1,346 0.2% 3,216   0.6% 654 0.2% 1,346 0.2% 3,216   0.6% 654 0.2% 1,346 0.2% 3,216   0.1% 15,761   0.1% 15,761   0.1% 15,761   0.1% 15,761   0.1% 12,500   0.6% 8,516   0.4% 458 0.6% 3,590 0.6% 8,516   0.4% 458 0.6% 3,590 0.6% 8,516   1.1% 1,243   1.243 1.243 1.348 1.9% 74,629   1.1% 1,243 1.9% 31,348 1.9% 74,629   1.1% 1,243 1.0% 6,154   0.0% - 0.0 |         | 25   |        |  |        |  | Plastic  |
| 0.8%         916         0.7%         4,680         0.7%         11,172         TOTAL CONSTRUCTION           4.3%         4,908         1.8%         11,283         1.8%         26,827         Demolition Waste           0.9%         1,047         0.6%         3,526         0.6%         8,413         Dry Wall           1.5%         1,767         2.0%         12,629         2.0%         30,096         Roofing           0.2%         262         0.4%         2,436         0.4%         5,770         Masonry           0.5%         524         0.2%         962         0.1%         2,265         Metal           0.3%         393         0.4%         2,436         0.4%         5,843         Carpet           0.6%         654         0.2%         1,282         0.2%         3,027         Other           3.3%         9,555         5.4%         34,554         5.4%         82,241         TOTAL DEMOLITION           0.9%         1,047         1.1%         6,988         1.1%         16,662         Cardboard           0.2%         262         1.0%         6,603         1.0%         15,761         Paper           2.8%         3,272  | 0.1%    | 65   | 0.1%   | 321  | 0.0%   | 740  | Cardboard  |
| 4.3% 4,908 1.8% 11,283 1.8% 26,827 Wood 0.9% 1,047 0.6% 3,526 0.6% 8,413 Dry Wall 1.5% 1,767 2.0% 12,629 2.0% 30,096 Roofing 0.2% 262 0.4% 2,436 0.4% 5,770 Masonry 0.5% 524 0.2% 962 0.1% 2,265 Metal 0.3% 393 0.4% 2,436 0.4% 5,843 Carpet 0.6% 654 0.2% 1,282 0.2% 3,027 Other 8.3% 9,555 5.4% 34,554 5.4% 82,241 TOTAL DEMOLITION    Industrial Waste   Cardboard Paper  | 0.1%    | 65   | 0.1%   | 449  | 0.1%   | 1,109  | Other  |
| 4.3%         4,908         1.8%         11,283         1.8%         26,827         Wood           0.9%         1,047         0.6%         3,526         0.6%         8,413         Dry Wall           1.5%         1,767         2.0%         12,629         2.0%         30,096         Roofing           0.2%         262         0.4%         2,436         0.4%         5,770         Metal           0.3%         393         0.4%         2,436         0.4%         5,843         Carpet           0.6%         654         0.2%         1,282         0.2%         3,027         Other           8.3%         9,555         5.4%         34,554         5.4%         82,241         TOTAL DEMOLITION           Industrial Waste           0.2%         262         1.0%         6,603         1.0%         15,761         Paper           2.8%         3,272         0.6%         3,654         0.6%         8,691         Metal           0.7%         851         1.0%         6,282         1.0%         14,960         Plastic           2.9%         3,338         1.1%         7,308         1.1%         17,363         Textiles  | 0.8%    | 916  | 0.7%   | 4,680  | 0.7%   | 11,172   | TOTAL CONSTRUCTION   |
| 0.9%         1,047         0.6%         3,526         0.6%         8,413         Dry Wall           1.5%         1,767         2.0%         12,629         2.0%         30,096         Roofing           0.2%         262         0.4%         2,436         0.4%         5,770         Masonry           0.5%         524         0.2%         962         0.1%         2,265         Metal           0.3%         393         0.4%         2,436         0.4%         5,843         Carpet           0.6%         654         0.2%         1,282         0.2%         3,027         Other           8.3%         9,555         5.4%         34,554         5.4%         82,241         TOTAL DEMOLITION           Industrial Waste           0.2%         262         1.0%         6,603         1.0%         15,761         Paper         Food           0.6%         3,272         0.6%         3,654         0.6%         8,691         Metal         Wood         Paper         Food           2.9%         3,338         1.1%         1,366         2.2%         3,216         Metal         Wood         Plastic         Textiles         Rubber   |         |  |        |  |        |  | Demolition Waste   |
| 1.5%         1,767         2.0%         12,629         2.0%         30,096         Roofing           0.2%         262         0.4%         2,436         0.4%         5,770         Masonry           0.5%         524         0.2%         962         0.1%         2,265         Metal           0.3%         393         0.4%         2,436         0.4%         5,843         Carpet           0.6%         654         0.2%         1,282         0.2%         3,027         Other           8.3%         9,555         5.4%         34,554         5.4%         82,241         TOTAL DEMOLITION           0.9%         1,047         1.1%         6,988         1.1%         16,662         Cardboard           0.2%         262         1.0%         6,603         1.0%         15,761         Paper           2.8%         3,272         0.6%         3,654         0.6%         8,691         Metal           0.7%         851         1.0%         6,282         1.0%         14,960         Paper           2.9%         3,338         1.1%         7,308         1.1%         17,363         Textiles           1.1%         1,243         4.9%  | 4.3%    | 4,908  | 1.8%   | 11,283   | 1.8%   | 26,827   | Wood   |
| 0.2%         262         0.4%         2,436         0.4%         5,770         Masonry           0.5%         524         0.2%         962         0.1%         2,265         Metal           0.3%         393         0.4%         2,436         0.4%         5,843         Carpet           0.6%         654         0.2%         1,282         0.2%         3,027         Other           8.3%         9,555         5.4%         34,554         5.4%         82,241         TOTAL DEMOLITION           Industrial Waste           0.9%         1,047         1.1%         6,988         1.1%         16,662         Cardboard           0.2%         262         1.0%         6,603         1.0%         15,761         Paper           2.8%         3,272         0.6%         3,654         0.6%         8,691         Metal           0.7%         851         1.0%         6,282         1.0%         14,960         Wood           2.9%         3,338         1.1%         7,308         1.1%         17,363         Textiles           1.1%         1,243         0.7%         4,295         0.7%         10,261         Rubber           <  | 0.9%    | 1,047  | 0.6%   | 3,526  | 0.6%   | 8,413  | Dry Wall   |
| 0.2%         262         0.4%         2,436         0.4%         5,770         Masonry           0.5%         524         0.2%         962         0.1%         2,265         Metal           0.3%         393         0.4%         2,436         0.4%         5,843         Carpet           0.6%         654         0.2%         1,282         0.2%         3,027         Other           8.3%         9,555         5.4%         34,554         5.4%         82,241         TOTAL DEMOLITION           Industrial Waste           0.9%         1,047         1.1%         6,988         1.1%         16,662         Cardboard           0.2%         262         1.0%         6,603         1.0%         15,761         Paper           2.8%         3,272         0.6%         3,654         0.6%         8,691         Food           0.6%         654         0.2%         1,346         0.2%         3,216         Metal           0.7%         851         1.0%         6,282         1.0%         14,960         Plastic           1.1%         1,243         0.7%         4,295         0.7%         10,261         Rubber           1  | 1.5%    | 1,767  | 2.0%   | 12,629   | 2.0%   | 30,096   | Roofing  |
| 0.5%         524         0.2%         962         0.1%         2,265         Metal         Carpet           0.3%         393         0.4%         2,436         0.4%         5,843         Carpet         Other           8.3%         9,555         5.4%         34,554         5.4%         82,241         TOTAL DEMOLITION           0.9%         1,047         1.1%         6,988         1.1%         16,662         Cardboard           0.2%         262         1.0%         6,603         1.0%         15,761         Paper           2.8%         3,272         0.6%         3,654         0.6%         8,691         Food           0.6%         654         0.2%         1,346         0.2%         3,216         Metal           0.7%         851         1.0%         6,282         1.0%         14,960         Wood           2.9%         3,338         1.1%         7,308         1.1%         17,363         Plastic           1.1%         1,243         0.6%         3,590         0.6%         8,516         Textiles           1.1%         1,243         4.9%         31,348         4.9%         74,629         Other           10.8%   | 0.2%    | 262  | 0.4%   | The second secon | 0.4%   |  |  |
| 0.3%         393         0.4%         2,436         0.2%         3,027         Other Other TOTAL DEMOLITION           8.3%         9,555         5.4%         34,554         5.4%         82,241         TOTAL DEMOLITION           0.9%         1,047         1.1%         6,988         1.1%         16,662         Cardboard           0.2%         262         1.0%         6,603         1.0%         15,761         Paper           2.8%         3,272         0.6%         3,654         0.6%         8,691         Metal           0.6%         654         0.2%         1,346         0.2%         3,216         Metal           0.7%         851         1.0%         6,282         1.0%         14,960         Wood           2.9%         3,338         1.1%         7,308         1.1%         17,363         Plastic           1.1%         1,243         0.6%         3,590         0.6%         8,516         Textiles           1.1%         1,243         4.9%         31,348         4.9%         74,629         Other           10.8%         12,369         11.1%         71,415         11.1%         170,060         TOTAL INDUSTRIAL           1.1%  | 0.5%    | 524  | 0.2%   | The state of the s |        |  | A CONTRACTOR OF THE CONTRACTOR |
| 0.6%         654         0.2%         1,282         0.2%         3,027         Other TOTAL DEMOLITION           8.3%         9,555         5.4%         34,554         5.4%         82,241         TOTAL DEMOLITION           0.9%         1,047         1.1%         6,988         1.1%         16,662         Cardboard           0.2%         262         1.0%         6,603         1.0%         15,761         Paper           2.8%         3,272         0.6%         3,654         0.6%         8,691         Metal           0.7%         851         1.0%         6,282         1.0%         14,960         Wood           2.9%         3,338         1.1%         7,308         1.1%         17,363         Plastic           0.4%         458         0.6%         3,590         0.6%         8,516         Textiles           1.1%         1,243         0.7%         4,295         0.7%         10,261         Total Industrial Waste           1.8         0.4%         458         0.6%         3,590         0.6%         8,516         Textiles           1.1%         1,243         4.9%         31,348         4.9%         74,629         Other  |         |  |        |  |        |  |  |
| 8.3%         9,555         5.4%         34,554         5,4%         82,241         TOTAL DEMOLITION           0.9%         1,047         1.1%         6,988         1.1%         16,662         Cardboard           0.2%         262         1.0%         6,603         1.0%         15,761         Paper           2.8%         3,272         0.6%         3,654         0.6%         8,691         Metal           0.7%         851         1.0%         6,282         1.0%         14,960         Wood           2.9%         3,338         1.1%         7,308         1.1%         17,363         Plastic           0.4%         458         0.6%         3,590         0.6%         8,516         Textiles           1.1%         1,243         0.7%         4,295         0.7%         10,261         Rubber           0.1%         13,348         4.9%         74,629         Other         TOTAL INDUSTRIAL           1.2%         1,374         1.0%         6,154         1.0%         14,616         Special Wastes           1.2%         1,374         0.0%         -         0.0%         -         Soil and Inert Materials           Asbestos         0.1%   | 0.6%    | 654  | 0.2%   | The second secon |        |  | BATTER AND A SECOND ASSESSMENT OF THE SECOND A |
| 0.9%         1,047         1.1%         6,988         1.1%         16,662         Cardboard           0.2%         262         1.0%         6,603         1.0%         15,761         Paper           2.8%         3,272         0.6%         3,654         0.6%         8,691         Food           0.6%         654         0.2%         1,346         0.2%         3,216         Metal           0.7%         851         1.0%         6,282         1.0%         14,960         Wood           2.9%         3,338         1.1%         7,308         1.1%         17,363         Plastic           0.4%         458         0.6%         3,590         0.6%         8,516         Textiles           1.1%         1,243         0.7%         4,295         0.7%         10,261         Rubber           0.1%         1,2369         11.1%         71,415         11.1%         170,060         TOTAL INDUSTRIAL           1.2%         1,374         1.0%         6,154         1.0%         14,616         Bulky Items           0.0%         -         0.0%         -         0.0%         -         Soil and Inert Materials           1.1%         1,309  | 8.3%    | 9,555  | 5.4%   | 2000   | 5.4%   |  | TOTAL DEMOLITION   |
| 0.2%         262         1.0%         6,603         1.0%         15,761         Paper           2.8%         3,272         0.6%         3,654         0.6%         8,691         Food           0.6%         654         0.2%         1,346         0.2%         3,216         Metal           0.7%         851         1.0%         6,282         1.0%         14,960         Wood           2.9%         3,338         1.1%         7,308         1.1%         17,363         Plastic           0.4%         458         0.6%         3,590         0.6%         8,516         Textiles           1.1%         1,243         0.7%         4,295         0.7%         10,261         Rubber           1.1%         1,243         4.9%         31,348         4.9%         74,629         Other           10.8%         12,369         11.1%         71,415         11.1%         170,060         TOTAL INDUSTRIAL           1.2%         1,374         1.0%         6,154         1.0%         14,616         Bulky Items           0.0%         -         0.1%         1,250         Asbestos           1.1%         1,309         0.2%         962         0.1% <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Industrial Waste</td>   |         |  |        |  |        |  | Industrial Waste   |
| 0.2%         262         1.0%         6,603         1.0%         15,761         Paper Food           2.8%         3,272         0.6%         3,654         0.6%         8,691         Food           0.6%         654         0.2%         1,346         0.2%         3,216         Metal           0.7%         851         1.0%         6,282         1.0%         14,960         Wood           2.9%         3,338         1.1%         7,308         1.1%         17,363         Plastic           0.4%         458         0.6%         3,590         0.6%         8,516         Textiles           1.1%         1,243         0.7%         4,295         0.7%         10,261         Rubber           1.1%         1,243         4.9%         31,348         4.9%         74,629         Other           10.8%         12,369         11.1%         71,415         11.1%         170,060         TOTAL INDUSTRIAL           1.2%         1,374         1.0%         6,154         1.0%         14,616         Bulky Items           0.0%         -         0.1%         1,250         Asbestos           1.1%         1,309         0.2%         962         0.  | 0.9%    | 1,047  | 1.1%   | 6,988  | 1.1%   | 16,662   | Cardboard  |
| 2.8%         3,272         0.6%         3,654         0.6%         8,691         Food           0.6%         654         0.2%         1,346         0.2%         3,216         Metal           0.7%         851         1.0%         6,282         1.0%         14,960         Wood           2.9%         3,338         1.1%         7,308         1.1%         17,363         Plastic           0.4%         458         0.6%         3,590         0.6%         8,516         Textiles           1.1%         1,243         0.7%         4,295         0.7%         10,261         Rubber           1.1%         1,243         4.9%         31,348         4.9%         74,629         Other           10.8%         12,369         11.1%         71,415         11.1%         170,060         TOTAL INDUSTRIAL           1.2%         1,374         1.0%         6,154         1.0%         14,616         Bulky Items           0.0%         -         0.0%         -         Soil and Inert Materials           0.0%         -         0.1%         1,250         Asbestos           1.1%         1,309         0.2%         962         0.1%         2,270  | 0.2%    | 262  | 1.0%   | 6,603  | 1.0%   |  | Paper  |
| 0.6%         654         0.2%         1,346         0.2%         3,216         Metal           0.7%         851         1.0%         6,282         1.0%         14,960         Wood           2.9%         3,338         1.1%         7,308         1.1%         17,363         Plastic           0.4%         458         0.6%         3,590         0.6%         8,516         Textiles           1.1%         1,243         0.7%         4,295         0.7%         10,261         Rubber           1.1%         1,243         4.9%         31,348         4.9%         74,629         Other           10.8%         12,369         11.1%         71,415         11.1%         170,060         TOTAL INDUSTRIAL           1.2%         1,374         1.0%         6,154         1.0%         14,616         Special Wastes           Bulky Items         Soil and Inert Materials         Asbestos         Other           1.1%         1,309         0.2%         962         0.1%         2,270         Other           2.3%         2,683         1.2%         7,629         1.2%         18,137         TOTAL SPECIAL   | 2.8%    | 3,272  | 0.6%   |  | 0.6%   |  | A 0 10 10 10 10 10 10 10 10 10 10 10 10 1  |
| 0.7%         851         1.0%         6,282         1.0%         14,960         Wood           2.9%         3,338         1.1%         7,308         1.1%         17,363         Plastic           0.4%         458         0.6%         3,590         0.6%         8,516         Textiles           1.1%         1,243         0.7%         4,295         0.7%         10,261         Rubber           1.1%         1,243         4.9%         31,348         4.9%         74,629         Other           10.8%         12,369         11.1%         71,415         11.1%         170,060         TOTAL INDUSTRIAL           1.2%         1,374         1.0%         6,154         1.0%         14,616         Bulky Items           0.0%         -         0.0%         -         0.0%         -         Soil and Inert Materials           1.1%         1,309         0.2%         962         0.1%         2,270         Other           2.3%         2,683         1.2%         7,629         1.2%         18,137         TOTAL SPECIAL   | 0.6%    | The state of the s |        |  |        | 3,216  | Metal  |
| 2.9%       3,338       1.1%       7,308       1.1%       17,363       Plastic         0.4%       458       0.6%       3,590       0.6%       8,516       Textiles         1.1%       1,243       0.7%       4,295       0.7%       10,261       Rubber         1.1%       1,243       4.9%       31,348       4.9%       74,629       Other         10.8%       12,369       11.1%       71,415       11.1%       170,060       TOTAL INDUSTRIAL         1.2%       1,374       1.0%       6,154       1.0%       14,616       Special Wastes         Bulky Items       Soil and Inert Materials         Asbestos         1.1%       1,309       0.2%       962       0.1%       2,270         2.3%       2,683       1.2%       7,629       1.2%       18,137       TOTAL SPECIAL   | 0.7%    | 851  |        |  | 1.0%   |  | BIA TANS INCOME.   |
| 0.4%         458         0.6%         3,590         0.6%         8,516         Textiles           1.1%         1,243         0.7%         4,295         0.7%         10,261         Rubber           1.1%         1,243         4.9%         31,348         4.9%         74,629         Other           10.8%         12,369         11.1%         71,415         11.1%         170,060         TOTAL INDUSTRIAL           1.2%         1,374         1.0%         6,154         1.0%         14,616         Special Wastes           Bulky Items         Soil and Inert Materials         Asbestos           0.0%         -         0.1%         1,250           1.1%         1,309         0.2%         962         0.1%         2,270           2.3%         2,683         1.2%         7,629         1.2%         18,137         TOTAL SPECIAL   |         |  |        | 200  |        |  |  |
| 1.1%       1,243       0.7%       4,295       0.7%       10,261       Rubber         1.1%       1,243       4.9%       31,348       4.9%       74,629       Other         10.8%       12,369       11.1%       71,415       11.1%       170,060       TOTAL INDUSTRIAL         1.2%       1,374       1.0%       6,154       1.0%       14,616       Bulky Items         0.0%       -       0.0%       -       50il and Inert Materials         0.0%       -       0.1%       1,250         1.1%       1,309       0.2%       962       0.1%       2,270         2.3%       2,683       1.2%       7,629       1.2%       18,137       TOTAL SPECIAL   |         | 100  |        | Econol Services  |        |  |  |
| 1.1%       1,243       4.9%       31,348       4.9%       74,629       Other TOTAL INDUSTRIAL         10.8%       12,369       11.1%       71,415       11.1%       170,060       TOTAL INDUSTRIAL         1.2%       1,374       1.0%       6,154       1.0%       14,616       Bulky Items         0.0%       -       0.0%       -       Soil and Inert Materials         0.0%       -       0.1%       1,250         1.1%       1,309       0.2%       962       0.1%       2,270         2.3%       2,683       1.2%       7,629       1.2%       18,137       TOTAL SPECIAL   |         | 100  |        | 90000  |        |  | Mark Control of the C |
| 10.8% 12,369 11.1% 71,415 11.1% 170,060 TOTAL INDUSTRIAL  1.2% 1,374 1.0% 6,154 1.0% 14,616 0.0% - 0.0% - 0.0% - 0.0% - 0.1% 513 0.1% 1,250 1.1% 1,309 0.2% 962 0.1% 2,270 2.3% 2,683 1.2% 7,629 1.2% 18,137 TOTAL SPECIAL   |         | 800  |        | 2007   |        | -  | E ANA COMPANY  |
| 1.2%       1,374       1.0%       6,154       1.0%       14,616       Bulky Items         0.0%       -       0.0%       -       0.0%       -       Soil and Inert Materials         0.0%       -       0.1%       1,250       Asbestos         1.1%       1,309       0.2%       962       0.1%       2,270         2.3%       2,683       1.2%       7,629       1.2%       18,137       TOTAL SPECIAL  |         | The second secon |        | The second secon |        | 400  |  |
| 1.2%       1,374       1.0%       6,154       1.0%       14,616       Bulky Items         0.0%       -       0.0%       -       0.0%       -       Soil and Inert Materials         0.0%       -       0.1%       1,250       Asbestos         1.1%       1,309       0.2%       962       0.1%       2,270         2.3%       2,683       1.2%       7,629       1.2%       18,137       TOTAL SPECIAL  |         |  |        |  |        |  | Special Wastes   |
| 0.0%       -       0.0%       -       Soil and Inert Materials         0.0%       -       0.1%       1,250       Asbestos         1.1%       1,309       0.2%       962       0.1%       2,270       Other         2.3%       2,683       1.2%       7,629       1.2%       18,137       TOTAL SPECIAL   | 1 2%    | 1 374  | 1.0%   | 6 154  | 1.0%   | 14.616   |  |
| 0.0%       -       0.1%       513       0.1%       1,250       Asbestos         1.1%       1,309       0.2%       962       0.1%       2,270       Other         2.3%       2,683       1.2%       7,629       1.2%       18,137       TOTAL SPECIAL   |         | 1,014  |        | 50   |        | 14,010   |  |
| 1.1% 1,309 0.2% 962 0.1% 2,270 Other 2.3% 2,683 1.2% 7,629 1.2% 18,137 TOTAL SPECIAL   |         |  |        | 100  |        | 1.050  |  |
| 2.3% 2,683 1.2% 7,629 1.2% 18,137 <b>TOTAL SPECIAL</b>   |         | 1 200  |        | The second second  |        |  |  |
|  |         | Communication ( )  |        | 200  |        |  |  |
| 100% 114,982 100.0% 641,069 100% 1,526,394 TOTAL WASTE STREAM  | 2.3%    | 2,083  | 1.2%   | 7,029  | 1.2%   | 18,137   | TOTAL SPECIAL  |
| * Based on observation data  |         |  |        | 641,069  | 100%   | 1,526,394  | TOTAL WASTE STREAM   |

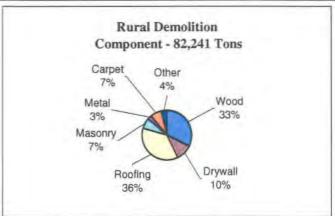
<sup>\*</sup> Based on observation data

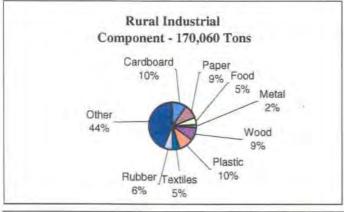
 $<sup>^{\</sup>star\star}$  Based on the weighted average from the 5 observed landfills and the 2 C&D landfills observed.

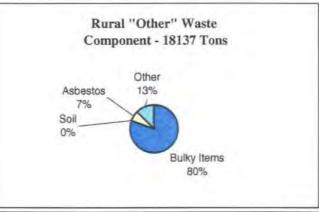
<sup>\*\*\*</sup> Total estimated material based on observation data and weighted average from remaining rural landfill:

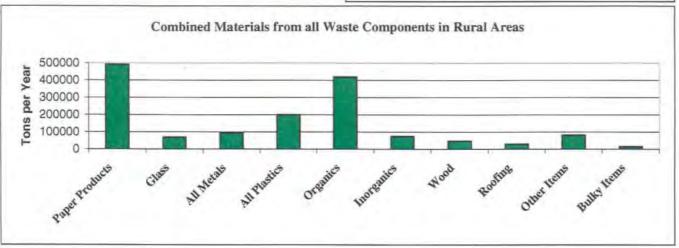


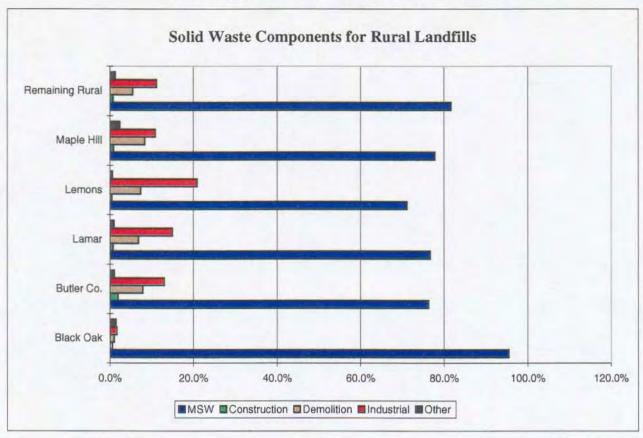


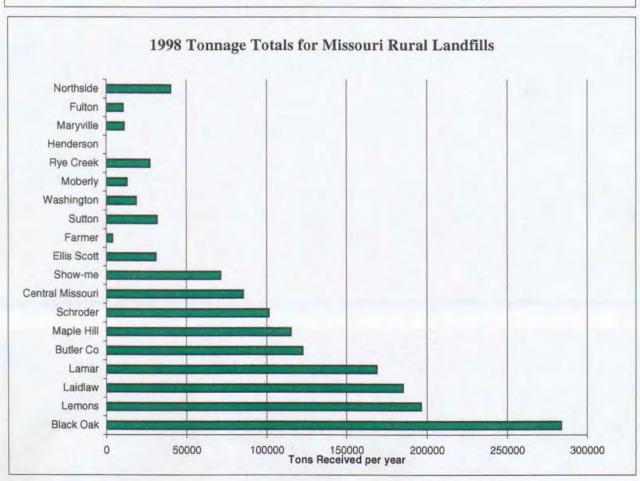












# Summary

The Missouri Solid Waste Composition Study was a three-year project to understand the characteristics and composition of solid waste entering transfer stations and landfills in Missouri.

Phase I examined Municipal Solid Waste (MSW) in 19 of the state's 20 solid waste management districts. During this two year activity, 140,581 pounds of residential and commercial MSW was hand sorted into 6 major material categories, 26 minor material categories, and 16 potentially hazardous categories. The results were recorded by weight and volume. Those results are explained on pages 93-122.

Phase II examined the non-MSW waste components at 14 landfills throughout Missouri. Waste loads deposited at these 14 landfills were observed for a one-week period at each facility. The waste was subjectively analyzed and recorded into one of five solid waste components (MSW, construction, demolition, industrial, and "other"). A further visual examination of each load was made and the percentage of each major material was estimated. Those estimated percentages were then applied to the weight of each load to determine the weight of each material. The results of each of the solid waste components (other than MSW) are explained on pages 123-138.

There were some minor differences found between disposal facilities examined in Phase I (see the chart on page 109). However during Phase II there was considerable difference in the waste composition of the landfills observed. Some of these differences could be explained through demographic similarities of the areas surrounding the landfills. The landfills were grouped by population demographics into three categories (large metropolitan landfills, small metropolitan landfills, and rural landfills). Results based on these groupings are explained on pages 139-166.

The table on page 168 lists the solid waste components and materials by landfill type and total for Missouri.

The charts on page 169 depicts the total solid waste components, the MSW component, and the construction component, in both tons per year and percent of the total.

The charts on page 171 depict the demolition waste components, the industrial waste components, and the "other" waste components, in both tons per year and percent of the total.

The charts on page 173 depict the tonnage for each solid waste material within each waste component, and the combined materials from all waste components.

| Municipal Solid Waste Paper Glass Metals Plastics Organics Inorganics TOTAL MSW  Construction Waste Wood Dry Wall Masonry Metal Plastic Cardboard Other TOTAL CONSTRUCTION  Demolition Waste Wood Dry Wall | Pct.  18.5% 2.9% 3.4% 7.2% 15.3% 2.4% 49.8%  3.8% 1.7% 1.2% | 75,390<br>89,892<br>187,745<br>400,524<br>62,767<br>1,301,140            | Pct.  15.1%     1.8%     2.3%     4.7%     10.6%     2.5%     36.9%  | Estimated Tonnage** 52,408 6,255 7,866 16,158 36,951 8,582 | 9ct. 30.0% 4.5% 5.8% 12.0% 25.7% | Estimated<br>Tonnage***<br>457,956<br>68,848<br>88,243<br>182,669 | Pct.  22.1%  3.4%  4.1%  | Estimated<br>Tonnage<br>993,166<br>150,493<br>186,001 |
|--|---|--|--|--|----------------------------------|---|--|---|
| Paper Glass Metals Plastics Organics Inorganics TOTAL MSW  Construction Waste Wood Dry Wall Masonry Metal Plastic Cardboard Other TOTAL CONSTRUCTION  Demolition Waste Wood                                | 2.9%<br>3.4%<br>7.2%<br>15.3%<br>2.4%<br>49.8%<br>3.8%      | 482,802<br>75,390<br>89,892<br>187,745<br>400,524<br>62,767<br>1,301,140 | 1.8%<br>2.3%<br>4.7%<br>10.6%<br>2.5%  | 52,408<br>6,255<br>7,866<br>16,158<br>36,951               | 4.5%<br>5.8%<br>12.0%            | 457,956<br>68,848<br>88,243<br>182,669                            | 3.4%<br>4.1%   | 993,166<br>150,493                                    |
| Glass Metals Plastics Organics Inorganics TOTAL MSW  Construction Waste Wood Dry Wall Masonry Metal Plastic Cardboard Other TOTAL CONSTRUCTION  Demolition Waste Wood                                      | 2.9%<br>3.4%<br>7.2%<br>15.3%<br>2.4%<br>49.8%<br>3.8%      | 75,390<br>89,892<br>187,745<br>400,524<br>62,767<br>1,301,140            | 1.8%<br>2.3%<br>4.7%<br>10.6%<br>2.5%  | 6,255<br>7,866<br>16,158<br>36,951                         | 4.5%<br>5.8%<br>12.0%            | 68,848<br>88,243<br>182,669                                       | 3.4%<br>4.1%   | 150,493   |
| Metals Plastics Organics Inorganics TOTAL MSW  Construction Waste Wood Dry Wall Masonry Metal Plastic Cardboard Other TOTAL CONSTRUCTION  Demolition Waste Wood  | 3.4%<br>7.2%<br>15.3%<br>2.4%<br>49.8%<br>3.8%              | 89,892<br>187,745<br>400,524<br>62,767<br>1,301,140                      | 2.3%<br>4.7%<br>10.6%<br>2.5%  | 7,866<br>16,158<br>36,951                                  | 5.8%<br>12.0%                    | 88,243<br>182,669   | 4.1%   |   |
| Plastics Organics Inorganics TOTAL MSW  Construction Waste Wood Dry Wall Masonry Metal Plastic Cardboard Other TOTAL CONSTRUCTION  Demolition Waste Wood   | 7.2%<br>15.3%<br>2.4%<br>49.8%<br>3.8%<br>1.7%              | 187,745<br>400,524<br>62,767<br>1,301,140                                | 4.7%<br>10.6%<br>2.5%  | 16,158<br>36,951   | 12.0%                            | 182,669   | 233  | 186.001   |
| Organics Inorganics TOTAL MSW  Construction Waste Wood Dry Wall Masonry Metal Plastic Cardboard Other TOTAL CONSTRUCTION  Demolition Waste Wood  | 15.3%<br>2.4%<br>49.8%<br>3.8%<br>1.7%                      | 400,524<br>62,767<br>1,301,140   | 10.6%<br>2.5%  | 36,951   |                                  |   | 0.00/  |   |
| Inorganics TOTAL MSW  Construction Waste Wood Dry Wall Masonry Metal Plastic Cardboard Other TOTAL CONSTRUCTION  Demolition Waste Wood   | 2.4%<br>49.8%<br>3.8%<br>1.7%                               | 62,767<br>1,301,140  | 2.5%   | 36,951   | 25.7%                            |   | 8.6%   | 386,572   |
| TOTAL MSW  Construction Waste Wood Dry Wall Masonry Metal Plastic Cardboard Other TOTAL CONSTRUCTION  Demolition Waste Wood  | 49.8%<br>3.8%<br>1.7%                                       | 1,301,140  | 200  | 8,582  |                                  | 391,527   | 18.5%  | 829,002   |
| Construction Waste Wood Dry Wall Masonry Metal Plastic Cardboard Other TOTAL CONSTRUCTION Demolition Waste Wood  | 3.8%<br>1.7%  | 1,301,140  | 200  |  | 3.6%                             | 55,543  | 2.8%   | 126,892   |
| Wood Dry Wall Masonry Metal Plastic Cardboard Other TOTAL CONSTRUCTION Demolition Waste Wood   | 1.7%  |  |  | 128,322  | 81.6%                            | 1,244,785   | 59.6%  |   |
| Dry Wall Masonry Metal Plastic Cardboard Other TOTAL CONSTRUCTION  Demolition Waste Wood   | 1.7%  |  |  |  |                                  |   |  |   |
| Masonry Metal Plastic Cardboard Other TOTAL CONSTRUCTION Demolition Waste Wood   |   | 100,208  | 2.4%   | 8,253  | 0.3%                             | 4,447   | 2.5%   | 112,908   |
| Metal Plastic Cardboard Other TOTAL CONSTRUCTION Demolition Waste Wood   | 1.2%  | 45,467   | 3.1%   | 10,753   | 0.2%                             | 2,630   | 1.3%   | 58,850  |
| Plastic Cardboard Other TOTAL CONSTRUCTION Demolition Waste Wood   |   | 31,772   | 0.8%   | 2,837  | 0.1%                             | 1,681   | 0.8%   | 36,290  |
| Cardboard Other TOTAL CONSTRUCTION Demolition Waste Wood   | 0.1%  | 2,485  | 0.1%   | 476  | 0.0%                             | 305   | 0.1%   | 3,266   |
| Other TOTAL CONSTRUCTION Demolition Waste Wood   | 0.3%  | 9,002  | 0.1%   | 411  | 0.0%                             | 195   | 0.2%   | 9,608   |
| TOTAL CONSTRUCTION  Demolition Waste Wood  | 0.7%  | 18,925   | 0.3%   | 1,113  | 0.0%                             | 740   | 0.5%   | 20,778  |
| Demolition Waste<br>Wood   | 0.4%  | 11,662   | 0.3%   | 950  | 0.1%                             | 1,109   | 0.3%   | 13,721  |
| Wood   | 8.4%  | 219,520  | 5.0%   | 17,500   | 0.7%                             | 11,172  | 5.5%   | 248,192   |
| Wood   |   |  |  |  |                                  |   |  |   |
|  | 5.2%  | 136,045  | 8.6%   | 29,980   | 1.8%                             | 26,827  | 4.3%   | 192,852   |
|  | 1.0%  | 27,392   | 1.0%   | 3,471  | 0.6%                             | 8,413   | 0.9%   | 39,276  |
| Roofing  | 3.6%  | 93,866   | 3.8%   | 13,155   | 2.0%                             | 30,096  | 3.1%   | 137,117   |
| Masonry  | 4.7%  | 123,924  | 3.5%   | 12,100   | 0.4%                             | 5,770   | 3.2%   | 141,794   |
| Metal  | 0.6%  | 16,651   | 0.3%   | 1,073  | 0.1%                             | 2,265   | 0.4%   | 19,989  |
| Carpet   | 0.6%  | 15,779   | 0.6%   | 2,188  | 0.4%                             | 5,843   | 0.5%   | 23,810  |
| Other  | 0.8%  | 21,961   | 0.5%   | 1,653  | 0.2%                             | 3,027   | 0.6%   | 26,641  |
| TOTAL DEMOLITION   | 16.7%   | 436,426  | 18.3%  | 63,620   | 5.4%                             | 82,241  | 13.0%  | 582,287   |
| Industrial Waste   |   |  |  |  |                                  |   |  |   |
| Cardboard  | 3.3%  | 87,000   | 4.1%   | 14,397   | 1.1%                             | 16,662  | 2.6%   | 118,059   |
| Paper  | 0.9%  | 23,025   | 1.8%   | 6,149  | 1.0%                             | 15,761  | 1.0%   | 44,935  |
| Food   | 1.4%  | 37,333   | 5.7%   | 19,698   | 0.6%                             | 8,691   | 1.5%   | 65,722  |
| Metal  | 0.1%  | 1,414  |  | 2,110  |                                  | 3,216   | 0.2%   | 6,740   |
| Wood   | 2.8%  | 72,612   | 3.4%   | 11,741   | 1.0%                             | 14,960  | 2.2%   | 99,313  |
| Plastic  | 0.9%  | 23,926   | 2.5%   | 8,703  | 2                                | 17,363  | 1.1%   | 49,992  |
| Textiles   | 0.1%  | 2,496  | 0.1%   | 253  | 0.6%                             | 8,516   | 0.3%   | 11,265  |
| Rubber   | 0.5%  | 12,507   | 0.2%   | 752  |                                  | 10,261  | 0.5%   | 23,520  |
| Other  | 0.9%  | 24,438   | 2.8%   | 9,844  | 4.9%                             | 74,629  | 2.4%   | 108,911   |
|  | 10.9%   | 284,752  | 21.2%  | 73,546   | 11.1%                            | 170,060   | 11.8%  | 528,358   |
| Special Wastes   |   |  | in the state of th |  |                                  |   | The state of the s |   |
| Bulky Items  | 1 69/   | 41 000   | 1 50/  | E 071  | 1.00/                            | 14.010  | 4 40/  | CO 700  |
| Soil and Inert Materials   | 1.6%  | 41,096   | 1.5%   | 5,071  | 1.0%                             | 14,616  | 1.4%   | 60,783  |
|  | 9.8%  | 257,316  | 16.2%  | 56,290   | 0.0%                             | 1 050   | 7.0%   | 313,606   |
| Asbestos   | 1.3%  | 33,826<br>40,038   | 0.4%   | 1,369  | 0.1%                             | 1,250   | 0.8%   | 36,445  |
| Other TOTAL SPECIAL  |   | 4(11)  |  | 4 100  | 0 40/                            | 0.070   | 4 00/  | 10 700  |
| TOTAL WASTE STREAM   | 1.5%  | 372,275  | 0.4%<br>18.5%  | 1,490<br>64,321  | 0.1%<br>1.2%                     | 2,270<br>18,137   | 1.0%<br>10.1%  | 43,798<br>454,733                                     |

<sup>\*</sup> Based on observation data from 5 sanitary and 2 C&D landfills, plus weighted average for Lee's Summit

<sup>\*\*</sup> Based on observation data from 2 landfills, plus the weighted average for Springfield.

<sup>\*\*\*</sup> Based on observation data from 5 landfills, plus the weighted average from 14 sanitary and 2 C&D rural landfills

